ACTIVITY MONITOR

USER'S MANUAL

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CHAPTER 1
General Information

General Computer Environment

The minimum recommended system is as follows:

- 800 MHz or faster computer with at least one free ISA or PCI slot, or one USB port.
- Windows 98, 2000, or XP
- 256 MB of RAM (512MB of RAM if running Windows 2000 or XP)
- 1 GB of free disk space
- CD-Rom drive
- Mouse

Installing the DIG-729 Interface Card

Always turn off the power before working on the computer or chambers. Neglecting this precaution may cause serious damage. If a DIG-729 PCI card is being used, install the DIG-729 card according to the instructions provided with the computer for installing a PCI card.

Installing the Activity Monitor Drivers and Software

Prior to installing the software, the necessary drivers must be installed on the computer. Insert the Activity Monitor CD into the CD-ROM drive and the screen shown in Figure 1.1 should appear. If it does not, open the CD-ROM drive containing the Activity Monitor CD and open the file named autorun.exe.

Figure 1-1 - Activity Monitor Main Menu

Welcome to Activity Monitor 5.
If you haven't installed the DIG729 driver yet, please click on the appropriate link for instrutions on installing the driver.
Once the DIG729 driver has been installed,
click on the Activity Monitor link to install the software.
To install Adobe Acrobat Reader click here.
To install the DIG729 ISA card click here.
To install the DIG729 PCI card click here.
To install the DIG729 USB device click here.
To install Activity MDBToExcel click here.
To install Activity Monitor 5 click here.
Exit

From the screen shown in Figure 1-1, select the type of DIG-729 device being used, then follow the instructions to install the device drivers. Once all of the necessary drivers have been installed, select **To install Activity Monitor 5 click here**.

Backing Up Software

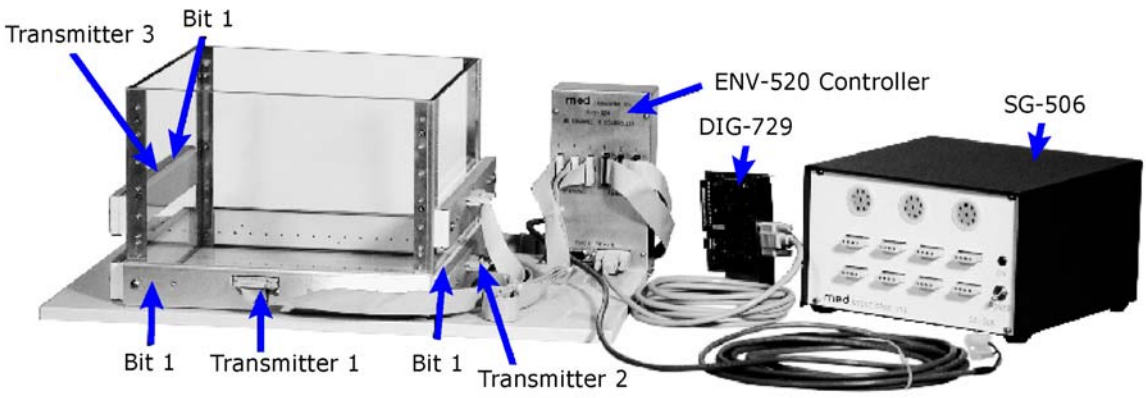
Making a backup copy of any data files created by Activity Monitor (especially the file DEFAULT.ZIP) is strongly advised.

Connecting the Activity Chambers

Connect the DIG-729 card to the ENV-520 Controller on Chamber #1 using the 15 pin SG-219C control cable.

NOTE: The chambers numbers are indicated on the ENV-520 Controllers. This number is factory set with jumpers inside the ENV-520 and should not be modified unless necessary (Appendix VI).

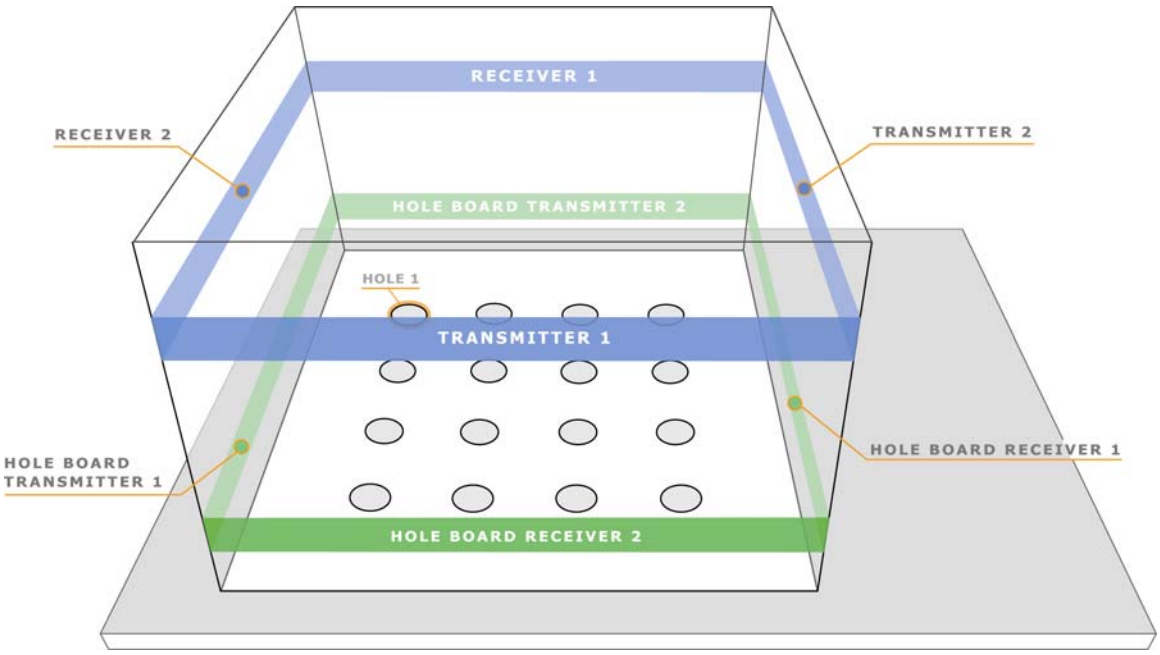
Figure 1-2 - Activity Chamber Setup



Additional chambers are connected via their ENV-520s controllers with SG-219C control cables, starting at Chamber #1 and proceeding in sequence, in a daisy chain fashion. For example, if there are four chambers, Chamber #1 connects to Chamber #2, Chamber #2 connects to Chamber #3, and finally Chamber #3 connects to Chamber #4. Ensure each connector is securely attached to the ENV-520 by tightening the screws on the cable. Connect the power cords from all ENV-520s to the SG-506 power supply. See Chapter 3 for a quick hardware test utility that can be run to verify proper operation of all photo beams before actually running an experiment.

MED Associates assembles equipment prior to shipment. The ribbon cables are connected from the ENV-520 to the I/R Array Strips as shown in Figure 1-2. The corresponding receiver strips are located directly opposite the transmitter strips.

Figure 1-3 - Activity Chamber with Hole Board Insert



- Hole Board Transmitters 1 and 2 connect to the “Transmitter 3” port on the ENV-520 Controller.
- Hole Board Receivers 1 and 2 connect to the “Receiver 3” port.
- Transmitter 1 gets connected to the “Transmitter 1” port.
- Transmitter 2 gets connected to the “Transmitter 2” port.
- Receiver 1 gets connected to the “Receiver 1” port.
- Receiver 2 gets connected to the “Receiver 2” port.

An easy way to check that the I/R Array Strips are correctly connected is to run a quick one-minute test experiment. Place an object into the test chamber and confirm that the red dot on the run-time screen is tracking correctly (i.e., back left in the chamber should be top left on the screen and front right in the chamber should be bottom right on the screen).

Modifying I/R Array Height

Do not assume that the factory set I/R Array heights are appropriate for the experiments being run. Different ages and strains of subjects may have vastly different physical characteristics. Also, because we have developed inserts (Chapter 5) to increase the system's functionality, the I/R Array strip heights from the environment floor may need to be adjusted.

The closer the I/R Array strips are placed toward the subjects' vertical center (for X & Y arrays), the better the data. If a subject is too low for the I/R strips, or capable of "crouching" periodically below the strips, the subject may disappear from "sight" of the system from time to time. The software is designed to remember the last location and pick back up when the subject becomes "visible" again. Typically, this will have little bearing on the data; however, if using Velocity data, there could be a sudden increase in a subjects' velocity and Jump Counts and Time will be affected. There may be other scenarios whereby inaccurate I/R strip placement may present erroneous data, so use care in this process.

The "Z" I/R Array strips should be placed in the lowest available position capable of detecting vertical activity and not detecting normal "X" & "Y" activity. If the strips are too high, some rearings may not be detected, or slight "bouncing" while rearing may cause multiple rearings to be detected when only one rearing episode was indeed elicited.

CHAPTER 2
Getting Started

General Software Information

Data analysis has been taken to an entirely new level with the addition of such measures as rotational behaviors, zone entries, jumping, etc. (Appendix II) added to the system. Data acquired on systems using Version 3.0 or higher may be reanalyzed in this version to obtain these new measures. The analysis parameters may be changed and the data re-analyzed to extract additional information.

The Activity Monitor is designed for use with MED Associates hardware to collect, plot, and analyze activity data. All standard data is displayed in real-time, along with a cumulative plot of the subject's activity. The data acquisition configuration files, which specify the state of the system (Resolution/Sample Rates, Ambulatory/Stereotypic Movement definitions), are stored in filename.CFG files. The default settings are user-defined and determined the very first time that the Activity Monitor software is run. See Chapter 3, for Configuration File set up.

In addition to providing the database to store all experiment and subject data and information, we have also provided the option to create an ASCII text and a "hard copy" printed summary data file automatically. After each subjects' session or after each experiment (multiple subjects), the software can print the summary data automatically and save a summary data file for each subject, simply by checking the appropriate check boxes in the preference settings window (Figure 3-3). Likewise, analyzed data and Raw Point data ASCII text files may also be generated aside from the database file. All ASCII text files are named according to the file-naming scheme presented in Table 3-4 and discussed in Appendix I.

There are two database files created by the Activity Monitor software: EXP.MDB and ANALYSIS.MDB. These files are Access® database files, but may be opened with many database programs. In order to extract precisely formatted data, they must be manipulated or sorted with a database program that can open a standard Access® scheme. We have opted to create this database to enable researchers to export an entire experiments worth of analyzed data, sorted and defined, into a spreadsheet to make Subject, Group, and Experiment data analysis simple and fast.

Introduction to Open-Field Activity Monitoring

Open-Field Activity (OFA) monitoring is a sensitive method of measuring both gross and fine locomotor activity in small animals. In general, computerized OFA characterizes multiple end points of motor behavior, and has proven to be a powerful assessment tool with many applications in behavioral pharmacology, toxicology, and genetics. For example, dopamine agonist studies can use distance traveled in centimeters as a measure of gross motor activity that is amenable to quantitative analysis. Opiate tolerance studies can examine overall distance traveled, but can also utilize time and distance in the margin of the chamber as well. Anxiety can also be characterized with an

OFA system using the above mentioned thigmotaxis measure and by examining patterns of exploration in a brightly lit arena with a dark area (See Dark Box Insert – Light/Dark Conflict Test). In addition, other models with proven construct validity, such as the hole board task and place preference, can also be performed with the MED Associates' System. These add-on components make the MED Associates' OFA system very versatile and an excellent value for laboratories that are both space and cost conscience.

Two standard sized environments, the ENV-510, 10.75" X 10.75" X 8" H (27 X 27 X 20.3 cm) and the ENV-515, 17" X 17" X 12" H (43.2 X 43.2 X 30.5 cm) are suitable for mouse and rat protocols, respectively. The system consists of a subject containment environment (chamber), infrared (I/R) sources and sensors, a system power supply, an environment data source controller, appropriate connecting cables, a PC/environment interface card, and the data acquisition/analysis software. Subject location is tracked using 16 evenly spaced I/R sources and sensors juxtaposed around the periphery of the four sides of the chamber. This I/R beam array defines an X and Y coordinate "map" for the system. The sensors detect the presence or absence of the I/R beam (i.e., the subject) at these corresponding coordinates.

At user defined time intervals, the software has instructions to "poll" the environment for the presence or absence of the I/R beam at each sensor. This is the scanning rate or sampling rate of the system. If the I/R beam fails to reach the sensor, the system registers this event as a broken beam and assumes the presence of the subject. Broken beams at X 1,2,3,4 and Y 2,3,4,5 are averaged, with the resulting microprocessor derived coordinate being X = 2.5 and Y = 3.5 or just 2.5, 3.5. The averaged beam breaks or subject "centers" are the data that the software algorithms use to derive the behavioral parameters such as distance traveled and time spent in a given zone. The software thus has a resolution of 32 x 32.

By scanning or "polling" the environment many times a second, the OFA system can effectively track the movement of a subject very precisely. The faster the scanning rate, the greater the accuracy of the system for high speed behavioral measures such as stereotypic behaviors, as well as for event-related, time-sorted data.

We offer variable scanning rates to accommodate personal preferences (

Table 3-1). Many researchers feel that there are few advantages to faster scanning rates for long trial runs where the data of interest does not require the increased rates. After all, faster scanning rates mean larger data files and longer post-hoc data analysis processing times.

For such researchers, we have designed the software so that measurements may be taken as small samples, repeated at preset intervals (

Table 3-1). This allows for focused data files and virtually eliminates the need to sort through large quantities of data to extract the desired measures. Experience in this matter will help to determine the test type, continuous or segmented, and the scanning rate that is best for the application.

The addition of a photo beam array above a subject adds a second plane of detection to the system. This is used to detect the presence or absence of a subject in this plane. The "Z" coordinate is used to detect rearing or standing on the hind legs.

The menu selections are outlined in the next chapter. The above general system and open-field information will assist with understanding what the menu selections mean and why they are important.

CHAPTER 3
Menu Options

To run the Activity Monitor, select the Activity Monitor program group and double click on the Activity Monitor icon. The main Activity Monitor screen appears with a copyright screen that disappears after a few seconds (Figure 3-1).

Figure 3-1 - Activity Monitor Copyright Screen

The main Activity window is now displayed. This window is blank. There is a menu displayed across the top of the window with all the software functions that are accessible within this blank window.

File Menu Options

Preferences

Select **File** | **Preferences** to setup the configuration file to match the system and the particular experiments. Parameters do not need to be entered every time an experiment is run. The default settings are user-defined and are determined the very first time that the Activity Monitor software is run.

The filename.CFG file controls how the software acquires the data, from the system-sampling rate to where the raw data files are to be located. The raw data is compressed in a filename.ZIP file automatically. Within this ZIP file are the raw binary data files that are named according to the date on which they were created (mmddyyyyA0 - Z99, i.e. 01012003.A0 (January 1, 2003), and are linked to their appropriate subjects' data file. These are the files used by the system for playback and analysis. The settings in the Preferences window may be changed at any time but may change the nature of summary data. Therefore it is not recommended that these settings be changed in the middle of running an experiment until this manual has been read. Experiment configuration settings, however, may not be changed in the middle of an experiment.

Figure 3-2 - File Pulldown Menu

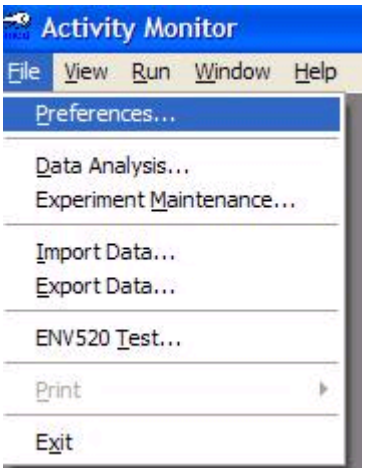
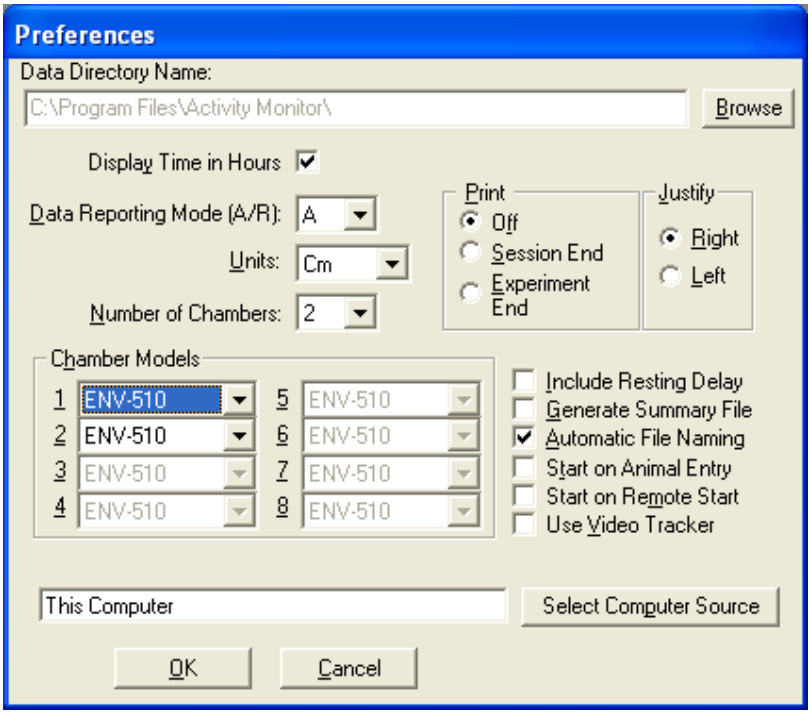


Figure 3-3 - Preferences Screen



NOTE: Changes to the Chamber Model, Units, and Include Resting Delay will change Summary Data measures, making them inconsistent. Use caution. This information is coupled with the Experiment Configuration File information to determine how the software records the data and where it stores the files, but is independent in that these settings may be changed in the middle of an experiment.

Following installation, the default configuration must be set up such that the software has the necessary information to begin acquiring data. The information entered in the Preferences window must reflect the system. In this manner, the default settings will match each individual system exactly.

The preferences screen requires the following information:

Table 3-1 - Preference Configuration Options

Item	Description
Data Directory Name:	The directory to store the data (*.ZIP) files. If unsure which directory to use, use the browse button. A subdirectory named DATA in the Activity Monitor directory is advised and must be created first. Also, this directory will also be the location of the database files (EXP.MDB and ANALYSIS.MDB), Summary, and Zone Analysis text files will be located. The program has been developed to create the database(s) and *.ZIP files in the chosen directory. This allows multiple users to have their own separate database of experiments. See Appendix V for details.
Data Reporting Mode: A = Absolute R = Relative	In Absolute mode each time bin holds the sum of all data since the experiment began. The Relative mode each time bin holds the sum of the data since the last time bin. The Data Reporting mode affects how the data looks when it is sent to the printer and how the data looks in the Summary data file. It is also used to determine how the data will be presented in the Analyzed data files.
Display Time in Hours	When checked, time is displayed as hours:minutes:seconds (000:00:00.00). If unchecked time is displayed in minutes as minutes:seconds (0000:00.00).
Units	The units of measure, centimeters or inches, that distance data will be displayed in.
Number of Chambers	The number of test chambers being used (1 – 8). The test chambers always start at number one and proceed in sequence (Chapter 1).
Chamber Models	Provides the chamber product number: ENV-510 for 10.75” X 10.75” (mouse) chambers with 16 beams ENV-515-16 for 17” X 17” (rat) chambers with 16 beams ENV-515-32 for 17” X 17” (rat) chambers with 32 beams VID-510 for 10.75” X 10.75” (mouse) chambers for use with Video Tracking Interface VID-515 for 17” X 17” (rat) chambers for use with Video Tracking Interface VID-410 for 7” X 9.5” (mouse) home cages to be used with Video Tracking Interface VID-415 for 8” X 17” (rat) home cages to be used with Video Tracking Interface It is important that the correct chamber is selected so that distance traveled data is calculated correctly. Different sized chambers may be used at the same time.
Print	These check boxes are used to automatically activate printing using the self-explanatory options: Off (do not print the data file) Session End (print the data file after each subject is run) Experiment End (print the data file when Run | Close Experiment is selected)
Justify	If Right is chosen, then all data will be right justified in its field. If Left is chosen, then all data will be left justified in its field. This can sometimes make it easier to import data into a spreadsheet program.

Item	Description
Include Resting Delay	As detailed in Appendix IV, the "Box" serves three primary functions; in particular, to filter movement data for a more precise distance traveled measure. Activation of this check box removes the filtering from the distance-traveled measure. This box should not be checked unless attempting to duplicate data that was generated on a system that does not have this "filtering" capability.
Generate Summary File	This option creates an ASCII text summary file that will be automatically saved in the data directory. If the Automatic File Naming option is turned on, then the file name is generated automatically from the values entered into the Subject, Experiment, and Group fields on the "Run Experiment" screen. The file will also have the extension "SUMMARY." This option allows the user to store to disk the summary data, which may also be printed, for backup. Every time that a subject is run, the new summary data is appended to the existing file.
Automatic File Naming	Creates data filenames according to the file-naming scheme presented in Appendix I. If this check box is not selected, the User must manually enter a file name.
Start on Animal Entry	Enables the system to begin a session as soon as the subject is placed into the chamber and the first sets of photobeams have been broken. This is a very nice feature for the hole board test and for starting sessions when the computer is in another room. This feature cannot be used with Video Tracking Interface.
Start on Remote Start	Enables the system to begin a session as soon as the Remote Start Event for that chamber has been set. This allows 3rd-party programs (like MED-PC IV) to remotely start the Activity chambers. If both "Start on Animal Entry" and "Start on Remote Start" are checked, the chamber will not start until it has received a Remote Start Event and the animal is present in the chamber. See Appendix VIII for more information on the Remote Start command.
Use Video Tracker	This feature must be enabled to allow collection by Activity Monitor of video tracking data captured via the Video Tracking Interface program.
Select Computer Source	When collecting data via the Video Tracking Interface (VTI), this option selects the computer that the VTI program is running on. In Windows 98, this information must be manually entered (typed); For example, if the VTI software is running on the computer "video", then enter the text \\video In Windows 2000 or XP, click on the "Select Computer Source" button to browse for the appropriate computer. If Activity Monitor is running on the same computer as VTI then clicking on "My Network Places" and clicking OK will set the computer to itself, as shown in Figure 3-3.

Chamber Models

Activity Monitor can acquire data for eight different test subjects simultaneously, as indicated by the drop down menus numbered 1 – 8 in the "Chamber Models" field of the Activity Monitor preferences screen shown in Figure 3-3. Video Tracking Interface (VTI) can acquire data from four cameras, depending upon the capabilities of the computer, and each camera can track either one, two or four animals depending upon the type of chamber/cage platform being used: VID-515, single rat activity chamber; VID-510, dual mouse activity chambers; VID-415, dual rat home cages; VID-410, quad mouse home cages.

When Activity Monitor is using VTI to acquire data, the chamber model used for each test subject (1 – 8, as appropriate) needs to be set in the **Chamber Model** field of the Activity Monitor preferences screen. The chamber model is dictated by the number of cameras VTI is using and also by the chamber/cage platform used.

VID-515 acquires data from one animal per camera, so for a two-camera setup chambers one and two should be set to VID-515.

VID-510 acquires data from two animals per camera, so for a two-camera setup chambers one through four should be set to VID-510.

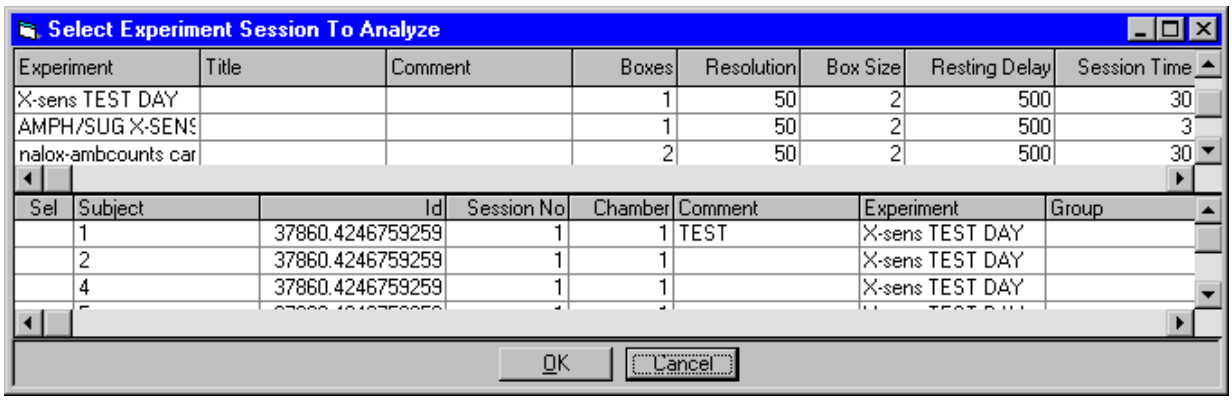
VID-415 acquires data from two animals per camera, so for a two-camera setup chambers one through four should be set to VID-415.

VID-410 acquires data from four animals per camera, so for a two-camera setup chambers one through eight should be set to VID-410.

Data Analysis

The **File** | **Data Analysis** option brings up a listing of data files for analysis or re-analysis. The data files are in the database EXP.MDB and are separated by Experiment ID. Clicking on the corresponding experiment (top list in Figure 3-4) and scrolling through the individual subject data sets (bottom list Figure 3-4) until the desired subject/session data is found can find a specific data set/session. Figure 3-4 shows the screen displayed when the Data Analysis menu option is selected. Chapter 4, has the necessary details to analyze the data. To select data to be analyzed, simply click on the subject/file name on the lower half of the screen display to activate that file. Use the Shift key to select more than one file to analyze. Column widths may be resized using the mouse in the header column.

Figure 3-4 - Data Analysis Database Window

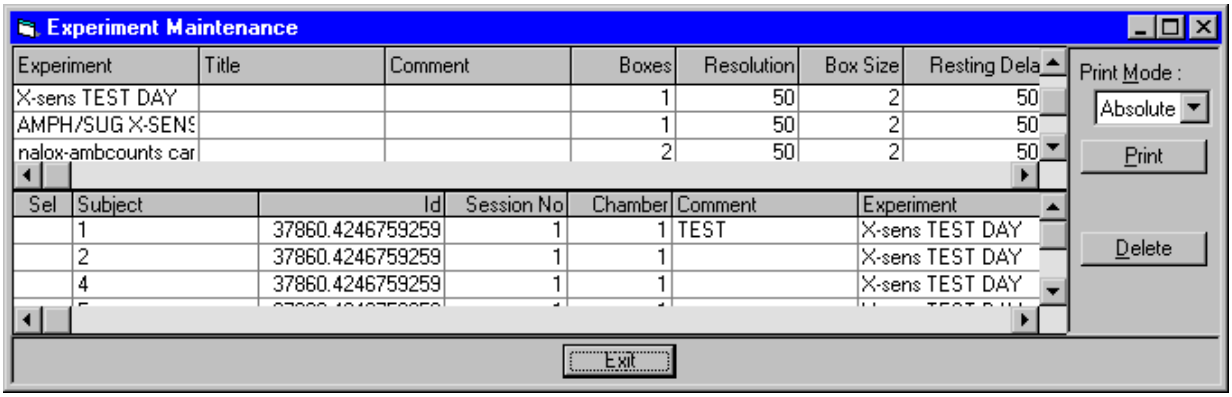


Experiment Maintenance

File | Experiment Maintenance menu option allows viewing, printing, and deleting of the information in the database (Figure 3-5). Clicking on the corresponding experiment (top list in Figure 3-5) and scrolling through the individual subject data sets (bottom list Figure 3-5) until the desired subject/session data is found can find a specific data set/session. To delete the data, left mouse click on the corresponding line. It will become outlined, then click the delete button. Column widths may be resized using the mouse in the header column.

The Print button can be used to reprint the Summary data file that was created when the experiment was first run. The data can be printed in either Relative or Absolute mode. If the data has been imported from a zip file, then it is not possible to reprint the Summary data file.

Figure 3-5 - Experiment Maintenance Window



Import Data

The **File** | **Import Data** option allows the user to import data acquired with this version and earlier versions of the Activity Monitor software, store the data in the database, and analyze this data with the latest measures. Import multiple *.ZIP files simply by using the Shift or Ctrl keys when selecting the files. Like data files that are created when an experiment is run, data files that are imported are reformatted and stored in the raw data *.ZIP file.

Export Data

The **File** | **Export Data** option allows an Activity data file to be selected and the point data saved as an ASCII text file with a filename generated according to the Data Filename scheme presented in Table 3-3, with a EXPORT extension. This utility is available for those researchers who wish to analyze data by writing a program in Visual Basic or some other language. Once a pattern is identified, the only way to extract very complex behaviors may be to do custom programming. MED Associates designs software with the most often used measures, but certain researchers may be interested in a particular behavior that only a few are knowledgeable enough to discern and differentiate. This can be done with ASCII point data. After selecting a data file, the **Save Raw Data** screen (Figure 3-6) appears. Click on the file to export. Another screen then displays (Figure 3-7) and requests the following information:

Table 3-3 - Saving Point Data as an ASCII File

Item	Description
Annotated File / Stripped File	Select the type of file output. The annotated file includes the experiment header information. The stripped file only includes the point data information. When importing information into a spreadsheet it is advisable to include the annotated file for the first data file and stripped files for each subsequent file.
Time:	Select the time period, in minutes to include in this file. Any part of a session or the entire session may be specified. This is typically used to save time by allowing specific sections of the data to be exported as determined during data analysis to view time sequenced data measures
Save As	Clicking on this button will bring up a Save As file screen so the filename for the point data may be entered.
Cancel	Exits the Save Raw Data screen without saving the data.

Figure 3-6 - Export Raw Data Screen

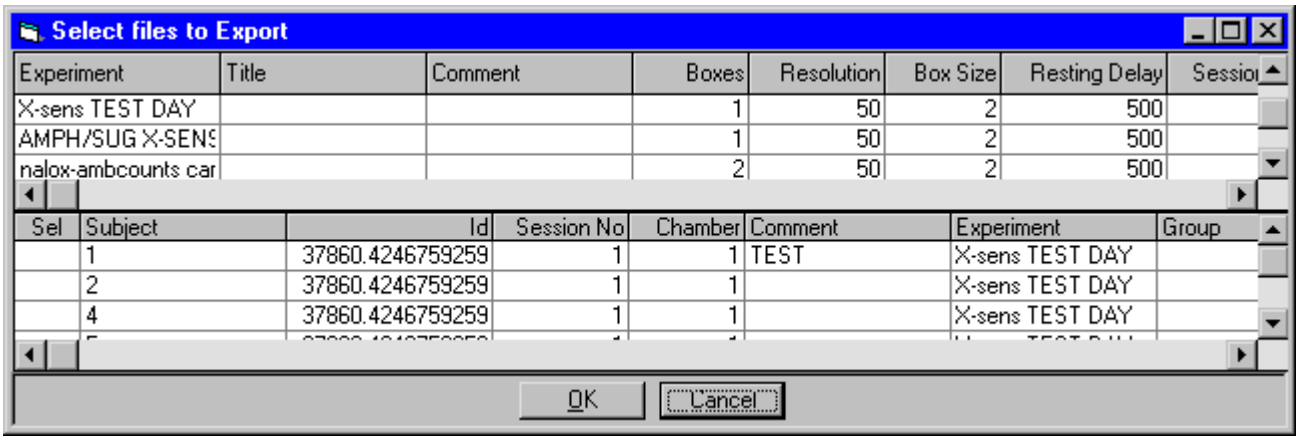
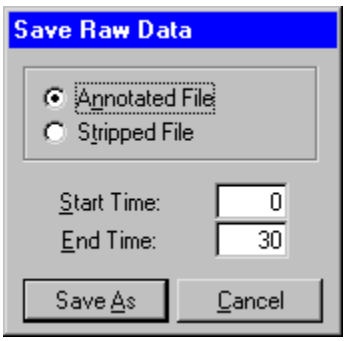


Figure 3-7 - Save Raw Data Screen



ENV-520 Test...

This menu option provides a graphical interface for testing the ENV-520 controller, photo beam strips, and the interrupt on the DIG-729 card for each chamber (Figure 3-8) and for all chambers simultaneously (Figure 3-9). This can also be used to test if the Video Tracking Interface (VTI) system is working properly. To test the VTI system, please be sure that the Preferences menu is set to **Use Video Tracking**, and that the appropriate computer is selected. Then start capturing data on the VTI system. Once this is done the ENV-520 Test can be run. This ensures that the equipment is in proper working order and identifies where hardware problems may be occurring. Should there be problems with the system, contact MED Associates for troubleshooting help.

This test should be run when the equipment is set up, and if using the DIG-729, before every session. First run the multi-chamber test by checking the Display Raw Values check box. Make sure that there are no subjects in the chambers. Click start. If the X, Y, or Z values are any number other than zero, check for obstructed photo beams. The number of beam breaks should be zero. If there are multiple beam breaks on the X, Y, or Z-axis when no subjects are in the chamber please contact MED Associates. If there are many chambers (nodes) with values other than zero, contact MED Associates.

Table 3-4 - ENV-520 Hardware Test Utility

Item	Description
Select Chamber	Select the chamber number to test. Only 1 chamber can be tested at a time.
Display Raw Values	This allows the viewing of the bit values for all chambers simultaneously.
Tick Count	Time increments
Start	Click this button to start the test. Photo beams that are blocked or not functioning, displays as a red dot. Functioning photo beams display with a gray dot.
Stop	Clicking on this button stops the interrupt and stops displaying data.
Exit	Exits the ENV-520 Test screen.

Figure 3-8 – ENV-520 Test Screen to Isolate Blocked or Non-Functioning Photobeams

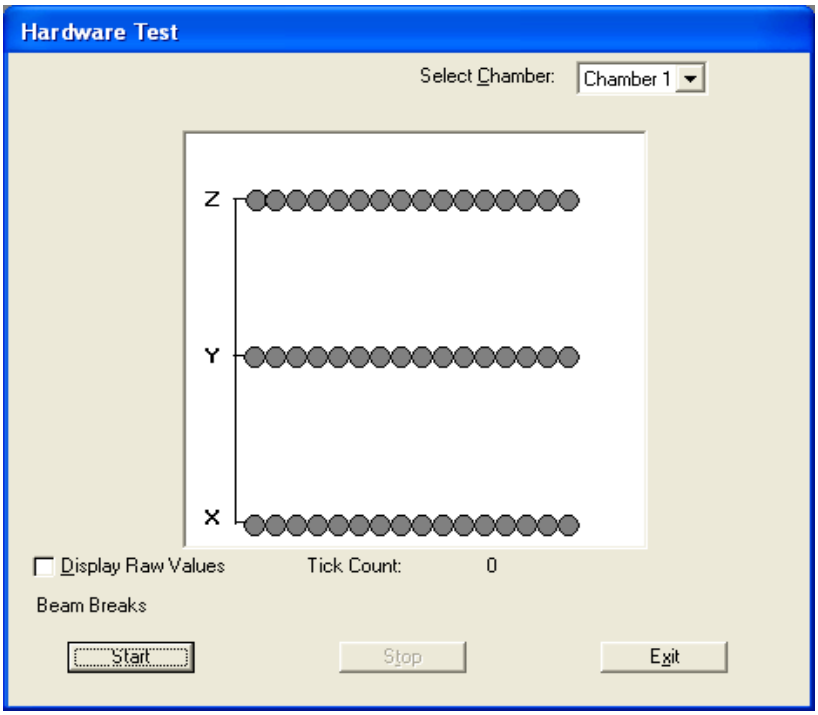
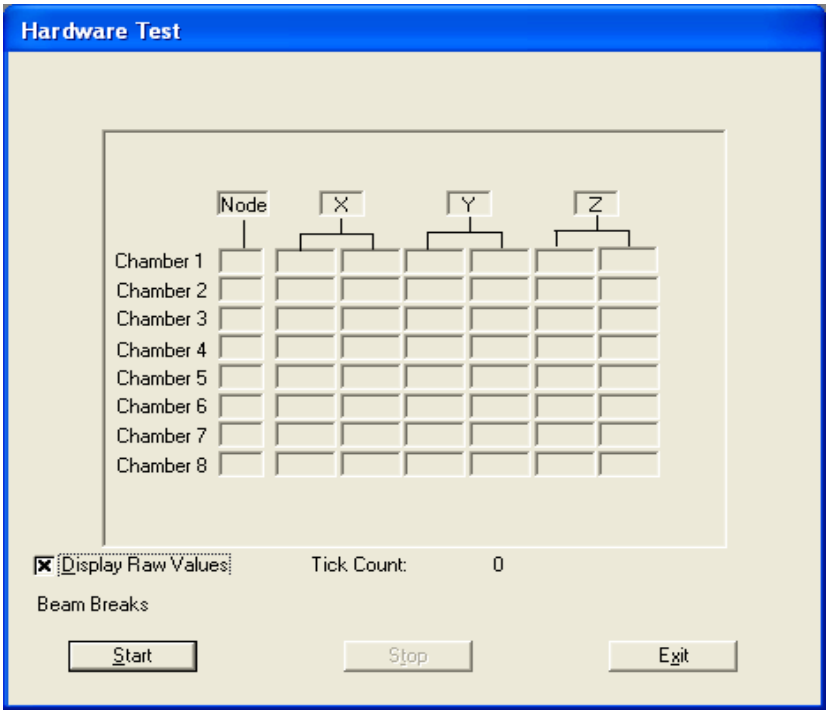


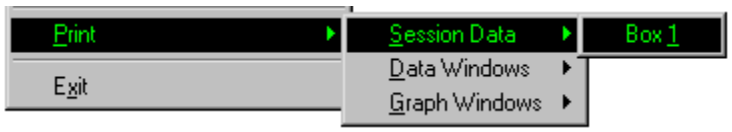
Figure 3-9 - ENV-520 Test Screen for All Chambers.



Print

The Print option is only available after an experiment is completed or after data has just been analyzed. Different menu options are available depending on whether an experiment finished or data was played back.

Figure 3-10 - Print Options Are Available After Running and Experiment or Analyzing Data



Session Data

Available only after an experiment is complete, this menu option prints the selected chambers' summary data files to the Windows default printer. This option may also be activated to automatically print by selecting the Print on Session End or **Experiment End** radio button on the **File | Preferences** screen (Figure 3-3).

Data Windows

Available after an experiment is complete or after a data analysis, this menu option prints the selected chambers' data windows to the Windows default printer.

Graph Windows

Available after an experiment finishes or after a data analysis, this menu option prints all the chambers' graph windows to the Windows default printer.

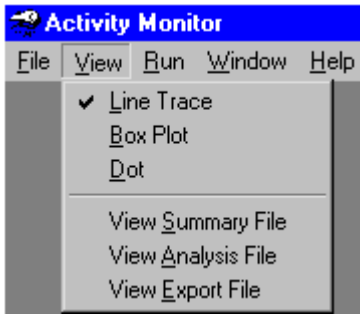
Exit

This exits the Activity Monitor program. If an experiment is running, the data saves and prints in the same fashion as canceling an experiment.

View Menu Options

These three options are used to determine how the subjects' activity displays graphically in the real-time display of activity and in the data analysis utility of the software, should Display Grid During Analysis be activated.

Figure 3-11 - View Pulldown Menu



Line Trace

This is the default plotting option. It plots a dot as the center of the subject and draws a line showing all movement.

Box Plot

This option shows the stereotypic box around the dot that represents the center of the subject. The subject can be seen moving within the box during stereotypic movements. When the subject becomes ambulatory, the box moves to the new center of the subject.

Dot

This option plots just the dot that represents the center of the subject.

View Summary File

This option will open and allow the user to view the contents of the summary data files (files that have the SUMMARY extension).

View Analysis File

This option will open and allow the user to view the contents of the data analysis files (files that have the ZONE extension.

View Export File

This option will open and allow the user to view the contents of the exported data files (files that have the EXPORT extension.

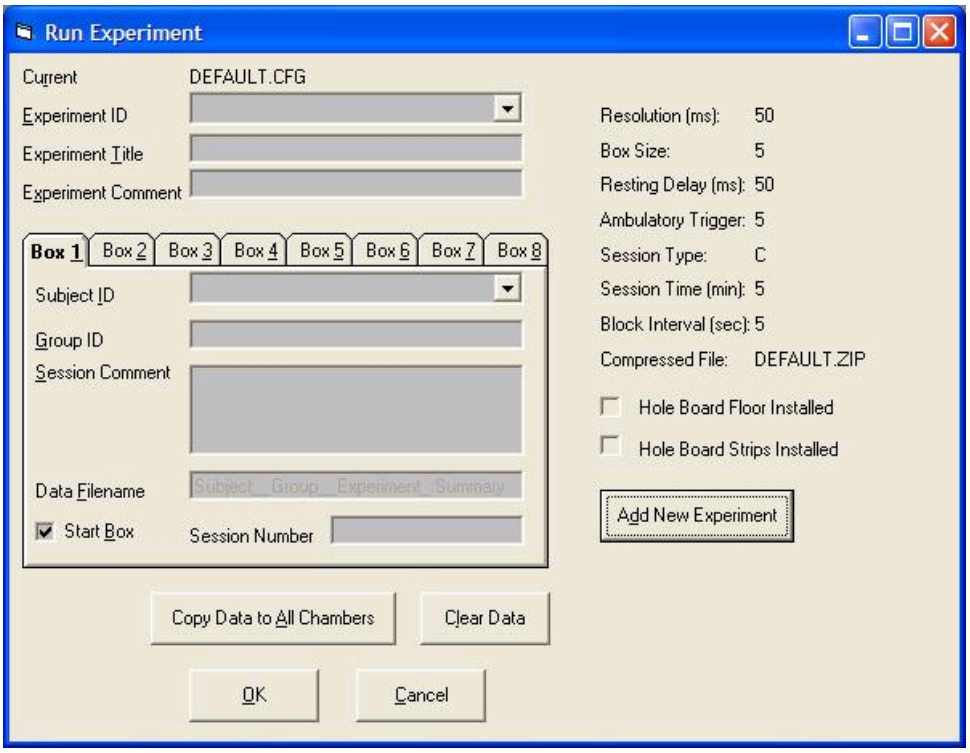
Run Menu Options

Figure 3-12 - Run Menu Options

Open Experiment

Select **Run** | **Open Experiment** to display the Run Experiment window that is the heart of this program. The **Run Experiment** screen (Figure 3-13) is the interface for the database(s) mediating experiment and subject data acquisition and storage. Since the Open Experiment menu option is actually the first in a series toward running the experiment, the majority of the associated information can be found in Chapter 6.

Figure 3-13 - Run Experiment Screen



The Run Experiment screen requires the following information:

Table 3-4 - Experiment Database and Run Screen

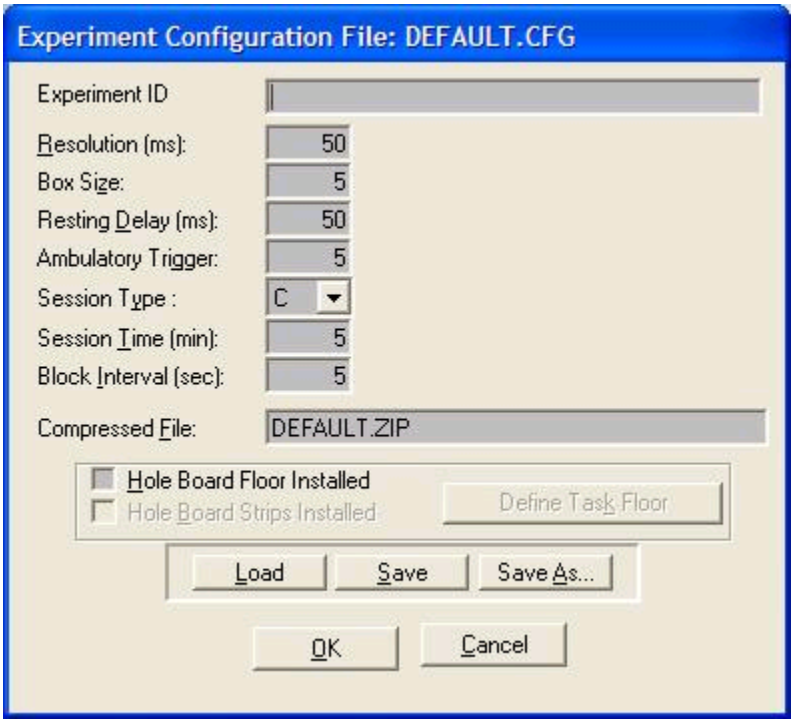
Item	Description
Current configuration: *	The current system configuration filename is displayed at the top of the experiment setup screen when creating a new experiment. It is important to note that once an experiment is started with a specific configuration, most parameters may not be changed "mid-stream" so that continuity is maintained throughout an experiment.
Experiment ID: *	The Experiment ID may be up to 25 characters and is used for both the Data Filename (below and Appendix I) and as a link throughout the database to sort data accordingly. This field is used to automatically generate the Data Filename (below). There is a drop down menu associated with the Experiment ID. The second time that an experiment is run, simply select from the drop down menu the experiment to be run. The database is now loaded with the appropriate subjects' information and experiment configuration parameters.
Experiment Title: *	Experiment title may be up to 25 characters. This is a descriptor field for the Experiment ID. When the Data Analysis or Experiment Maintenance windows is opened, the Experiment Title is visible. This description of the experiment is present to allow the user to visualize which data sets may be selected for analysis, re-analysis, deletion, etc.
Experiment Comment: *	Maintained for database purposes and allows the user to add additional information pertaining to a given experiment.
*	These fields are experiment specific in nature. The information entered here is included in the database for all subjects run under this Experiment ID and Title. These subjects' data will also have been collected using the stated configuration file and will have the added experiment Comment.
Box # 1 - 8 Index Card Tab††	Activates the particular chambers' data entry screen. The active screen's information is subject/chamber specific in nature and is logged accordingly in the database.
Subject ID: †	Subject identifier, with 25 available characters. This field is used to automatically generate the Data Filename (below). There is a drop down menu associated with the Subject ID. The second time that an experiment session is run, simply select from the drop down menu the subject to be placed in the corresponding chamber. The database is now loaded with the appropriate subject's session number and all corresponding information.
Group ID: †	Used as an identifier, with 25 available characters, and is linked to the Subject ID the first time that a subject is run in an experiment. This field is used to automatically generate the Data Filename (below).
Session Comment: †	All comments entered in this screen are subject specific in nature and are added to each subjects' session data file.
Data Filename: †	All data filenames are generated using the Subject ID, the Group ID, and Experiment ID. See Appendix I for details. If automatic file naming is turned off a filename may be entered.

Item	Description
Start Box††	Used to tell the software to start the chamber when OK is clicked. If the Start on Animal Entry check box is activated in the Preferences screen and saved in the current *.CFG file, then the session begins as soon as the subject is placed into the chamber and the first photo beams are broken.
Session Number	Enter the session number in this field.
Copy Data to All Chambers	Copies the information in the current screen to all the other chambers. All data is copied except the Subject ID.
Clear Data	Clears all the data fields.
OK	If the Start Box check box is activated, closes the Chamber ID screen and starts the chambers.
Cancel	Closes the Run Experiment screen without running the experiment and deletes and chamber/subject specific information entered.
Add New Experiment	Clicking this button brings up the screen shown in Figure 3-14. Experiment Configuration sets data acquisition and ambulatory data parameters. Included in the Experiment Configuration File are the settings necessary to run a Hole Board test and to choose session type.
†	Subject specific in nature and added to a given subjects data file accordingly. This information is only linked to chamber specific information for a given session.
††	These fields are chamber specific in nature and reflect the state of a given chamber during a given session.

Add New Experiment

Selecting **Add New Experiment** from the **Run Experiment** menu causes the screen shown in Figure 3-14 to appear. These settings may be modified in Data Analysis to examine the parameters in greater detail. Included in the experiment configuration file is the Hole Board Task definition. See Chapter 7, for more information.

Figure 3-14 - Experiment Configuration



By saving the entered settings using the **Save As** or **OK** buttons as DEFAULT.CFG, the first experiment is ready to be run using these settings. It is recommended that file names for configuration files reflect the protocol that is to be run. For example, changes in Box Size, Ambulatory Trigger, and Resting Delay for use in amphetamine studies could have a filename that reflects its usage, like Amphetamine_Box_Size.CFG. DEFAULT.CFG should be used for the first practice experiment and kept on the computer in the Activity Monitor directory. It is important to note that once an experiment is started with a specific configuration, it may not be changed “mid-stream” so that continuity is maintained throughout an experiment.

The Experiment Configuration screens require the following information:

Table 3-6 - Experiment Configuration Information

Item	Description
Resolution (ms) min - 25 max – 250	The rate that the Activity Monitor acquires the data from the test chambers. This rate is user-definable to enable variable data acquisition rates; thus, minimizing file size, or maximizing resolution, depending upon the type of data sought and the size of the hard drive. Larger data files require more disk space and longer analysis times. This rate is automatically set to $33^{1/3}$ ms when using the Video Tracking Interface system. This setting is a vestige of days gone by when hard disk size and memory were limiting factors. It is recommended that 50 ms or less be used if using a new computer with plenty of disk space.
Box Size (beams) min - 1 max – 8	Box size serves three primary functions: One, to delineate the maximum area that a subject may move within, and after the Resting Delay (ms) criteria has been met (below), to have each movement measures as a Stereotypic Count. If stereotypic is the primary measure, the size of the Box should be set to the maximum distance that the stereotypic behavior would attain without leaving (i.e. grooming could use a Box Size of 2 or 3 and head weaving could use a Box Size of 3 or 4). Two, to "filter" movement data so that distance-traveled measures do not include "bouncing" or "flickering" artifacts. Three, the Box Size, Ambulatory Trigger and Resting Delay settings combine to create a threshold whereby a subject must move a certain distance (Box Size) in a maximum amount of time (Resting Delay) to maintain its ambulatory status. This is actually a method to define large (ambulatory/quick) and small (stereotypic/slow) movements. See Appendix IV. Standardized settings are not available, but would be dependent upon the application being used (ataxic vs. non-ataxic subjects) and the strain of mice being studied. Box size can be changed in Data Analysis.
Resting Delay (ms) min - 50 max - 2000	The Resting Delay is the amount of time the subject has to pass through the box (above) to maintain its ambulatory status, or to make another ambulatory movement after the last ambulatory movement. See Appendix IV. Resting Delay can be changed in Data Analysis.
Ambulatory Trigger	The number of beam breaks, after leaving the box, necessary to initiate an ambulatory episode and to have the ambulatory distance considered in the Velocity measure.
Session Type (C, S)	Select "C" for a Continuous session. Select "S" for a Segmented session. If a Segmented session is chosen, the configuration screen changes.
Session Time (min)	The amount of time for the session to run.
Block Interval (sec.)	The size of the Blocks (time bins) that the data are to be broken down into in the summary data files and the data that will be sent to the printer. This may be changed in Data Analysis.
Compressed File	Name of the ZIP file to store the raw data. If an extension is given, it will be ignored. See Appendix I. See Appendix V for multiple users and *.ZIP files.

Item	Description
Hole Board Floor Installed	This option must be checked if the Hole Board Insert is being used. Please note that the Video Tracking Interface does not support the Hole Board.
Hole Board Strips Installed	This option must be checked if the Hole Board I/R (4 x 4) arrays are being used to run the Hole Board Task test and the "X" and "Y" photo beams are being used to monitor general activity.
Define Task Floor	Click to view task definition screen (Figure 7-4).
Load	This option allows the selection of the experiment configuration file that will be used by the program to determine the data properties.
Save	Saves the present configuration information to the already named filename.CFG. For new configurations, use the Save As option.
Save As...	Brings up a Save As window a filename may be specified. When setting up the software for the first time, use the DEFAULT.CFG file name specified in the Save As window.
OK	After loading, changing existing, or creating new *.CFG files, this option allows the exiting of the Experiment Configuration File window.
Cancel	Exits the configuration screen without saving the information.

Close Experiment

Select **Run | Close Experiment** to abort a running experiment or close the run-screen when all subjects have finished. If print data at the end of an experiment (Figure 3-3) has been selected, this is when the summary data file will print. All the data that has been collected up until the time that the experiment was canceled, if still active, saves in the file names specified during Experiment Setup (Table 3-6 and Appendix I). If aborted experiment data files need to be deleted, it is best to do so immediately via the Experiment Maintenance window (Figure 3-5).

Start

The **Run | Start** option displays the Run Experiment screen (Figure 3-13), where the subject specific and chamber specific information is entered. Clicking OK then starts the session.

There are two Start options available while the experiment is running. Both are context sensitive in that the Start Windows pull down menu option and the Start right mouse click menu options are active window specific. For example, if there is eight chamber windows displayed and start is selected from the pull down menu, one of the box index tabs will be prominent. Viewing the chamber number in the mid-left side of the window indicates which window is active. The active chambers' window has a more prominent number than the other chamber numbers. That box depicts the active window of the eight. Clicking on a chamber display window and then selecting Start from the Run pull down menu causes that chamber (box) to be the prominent chamber (box) displayed in the Run Experiment screen. Likewise with the right mouse click menu, the computer

mouse is placed over a specific chamber' display window and right mouse click, that chamber will be the selected chamber when Start is clicked.

Cancel

The **Run | Cancel** option cancels selected active chambers' sessions. This is the same as closing an experiment except that only the selected chambers' session is canceled. The data that was acquired up until the time the cancel was initiated saves to the corresponding subjects' file. Session data may be deleted using the Experiment Maintenance utility (Figure 3-5).

Pause

The **Run | Pause** option allows the user to pause a chambers' data acquisition, for whatever reason, and resume (below) when applicable.

Resume

The **Run | Resume** option resumes a paused chamber (above).

Window Menu Options

Tile

Arranges the windows in a tile fashion.

Maximize

Maximizes the active chamber's display window.

Restore

Restores the chamber-display windows to tiled.

Help Menu Options

Index

Opens the Activity Monitor Help file and brings up the index.

Using Help

Opens Window's **How to Use Help** file.

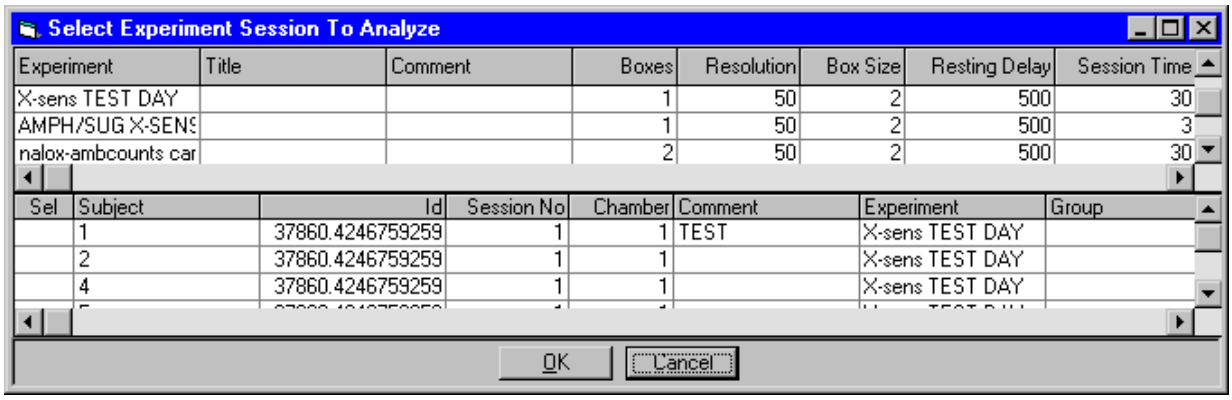
About Activity

Displays the Activity Monitor copyright and version screen.

CHAPTER 4
Data Analysis Menu Options

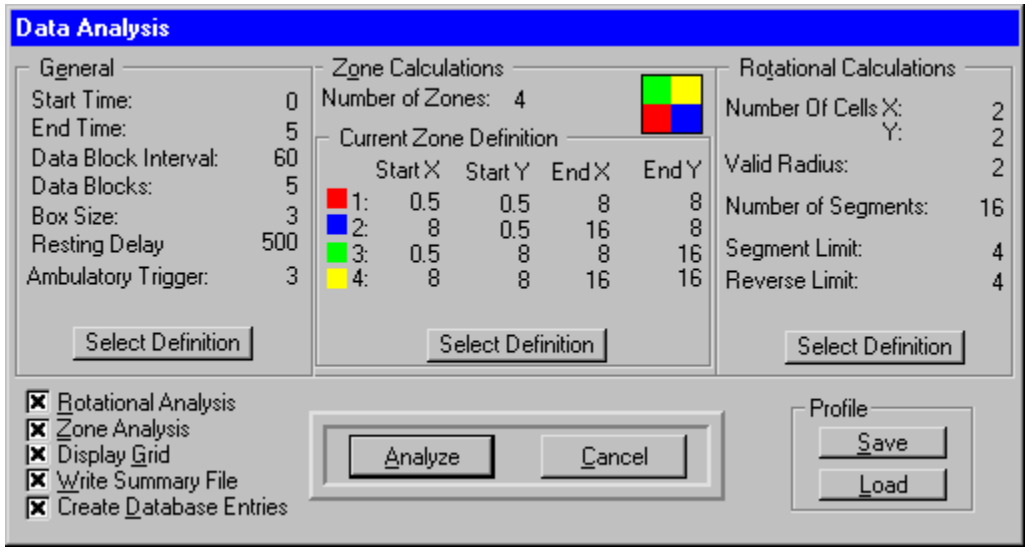
Data Analysis Setup

Figure 4-1 - Data Analysis Database Window



After running an experiment, select **File | Data Analysis** to view a listing of experiment and subject/session data files (Figure 4-1). Once the appropriate experiment and subject have been selected, click on the **OK** button and the Data Analysis screen appears (Figure 4-2). This screen is divided into three categories, **General**, **Zone Calculations**, and **Rotational Calculations**. This screen displays selected analysis numbers and check box annotations, which are set in the associated Select Definition windows of the program (Figure 4-8 - Figure 4-10).

Figure 4-2 - Data Analysis Screen



There are five check boxes that control the following:

Table 4-1 - Data Analysis File (Display and Analysis Sections)

Item	Description
Rotational Analysis	Activates the select definition bar to define the rotational behavioral analysis. These parameters are defined in the corresponding Select Definitions display window (Figure 4-8 - Figure 4-10). Activation of the check box increases the analysis time considerably.
Zone Analysis	Activates the select definition bar to define the zone analysis. These parameters are defined in the corresponding Select Definitions display window (Figure 4-5 – Figure 4-7).
Display Grid	View subject movement graphics and the associated measures while the data are being analyzed. This is nice to see when the program is first run; however, when analyzing multiple data sets (perhaps 100s), this feature slows down the analysis time considerably. It also allows movement plot graphics to be printed at the end of the analysis.
Write Summary File	Automatically generate an ASCII text file of the analysis data. These summary analysis data files are named according to the file naming structure. Every time that a subject is run and the data is analyzed or re-analyzed, the associated data measures are appended to the file. These data are always in the common subject data file. The same analysis information is also present in the ANALYSIS.MDB database file.
Create Database Entries	Create ANALYSIS.MDB database entries of the analyzed measures. Both ASCII text and database files are generated if both Write Summary File and Create Database Entries check boxes are activated.

General Analysis Information

Figure 4-3 - General Analysis - Continuous Experiments

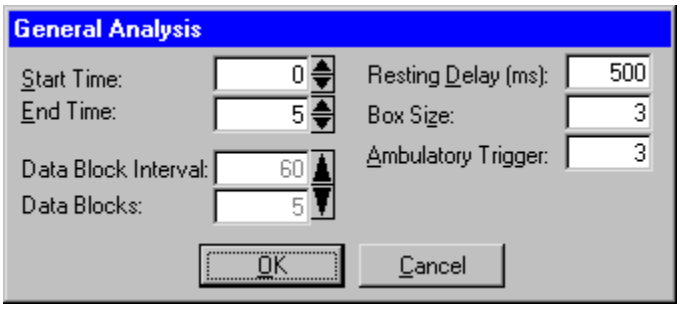
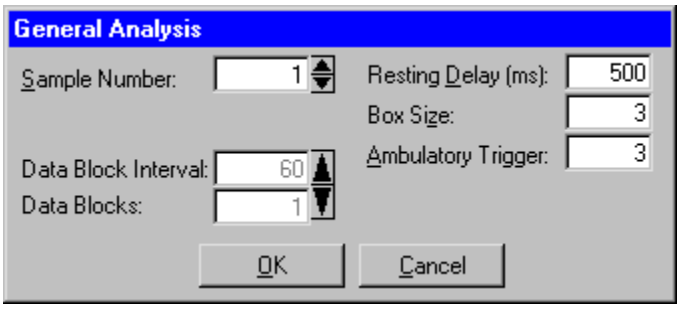


Figure 4-4 - General Analysis - Segmented Experiments



The first Select Definition grouping is the General Analysis group. These parameters were established in the Experiment Configuration setup, but may be modified for data analysis.

The following parameters may be changed in the General Analysis section:

Table 4-2 - General Data Analysis

Item	Description
Start Time default - 0	Select the minute to start the data analysis from. The default and recommended setting for first time data analysis is 0. Like End Time, listed below, this feature is useful primarily only after data has already been analyzed and specific time bins need to be further defined.
End Time default - end time	Select the minute that the data analysis should stop. The default is the end of the protocol. This feature is useful primarily after data has already been analyzed and specific time bins need to be further defined and analyzed using, usually, smaller time blocks.
Sample Number	If a segmented experiment was run, then the Sample Number option will appear instead of the Start Time and End Time options. The Sample Number option allows for selection of which segment to analyze.

Item	Description
Data Block Interval Sec.	Data may be analyzed as a series of time blocks. This feature is useful for examining instantaneous values (1 sec) or larger to determine time sequenced or event related values. A summary total of all of the data blocks is always provided in the output data file. This interval is independent from the interval set in the Experiment Configuration screen in that this value may be changed for each data file re-analysis. The Experiment Configuration Block Interval is used only for summary and print data.
Data Blocks Numeric	The number of Data Blocks is established when the analysis time (entire session or a portion there of as defined by the Start and End Time listed above) is broken up by the Data Block Interval.
Box Size (beams) min - 2 max – 8	Box Size serves three primary functions: One, to delineate the maximum area that a subject may move within, and after the Resting Delay (ms) criteria has been met (below), to have each movement counted as a stereotypic movement. Two, to "filter" movement data (Appendix IV). Three, the Box Size and Resting Delay settings combine to create a threshold whereby a subject must move a certain distance (Box Size) in a maximum amount of time (Resting Delay) to maintain its ambulatory status.
Resting Delay (ms) min - 50 max - 2000	The Resting Delay is the amount of time the subject has to pass through the box (above) to maintain its ambulatory status, or to make another ambulatory movement after the last ambulatory movement. See Appendix IV.
Ambulatory Trigger	The number of beam breaks, after leaving the box, necessary to initiate an ambulatory episode and to have the ambulatory distance considered in the Velocity measure. See Appendix IV.

Zone Analysis

The Zone Setup screen allows the user to define the X and Y coordinates of the zones to be analyzed. All of the behavioral measures will then be determined for each zone, as well as totals for all zones. Up to 4 zones plus 1 residual zone may be created or selected (Figure 4-5). A number of preset zone options have been provided. They include Horizontal, Vertical, Quadrant, Corner, and a number of user-definable, and savable, spaces for custom zones (Figure 4-6). The zones defined must be rectangular in shape and cannot overlap one another. Any part of the activity area that is not defined within a zone is counted as the residual area (Figure 4-5 and Figure 4-7).

Figure 4-5 - Zone Setup Screen Illustrating Pre-Defined Menu Options and Residual Area

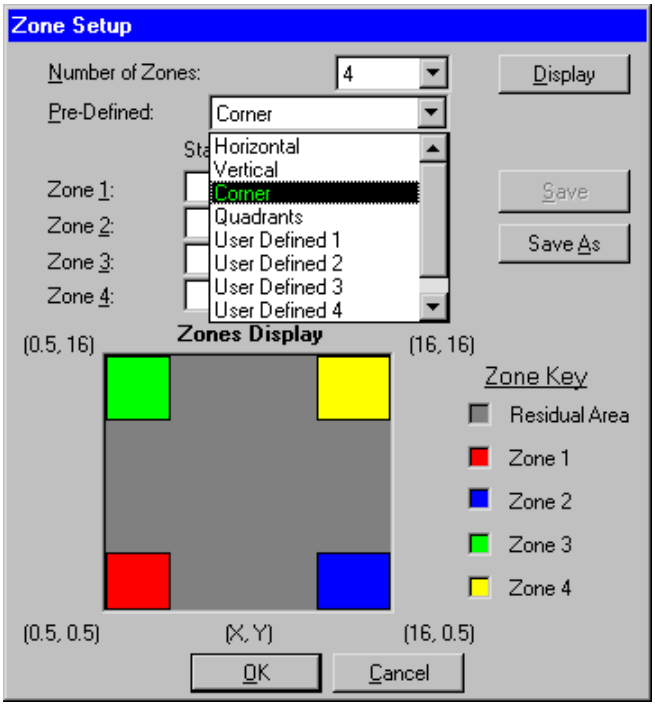


Figure 4-6 - Save Customized Zone Settings

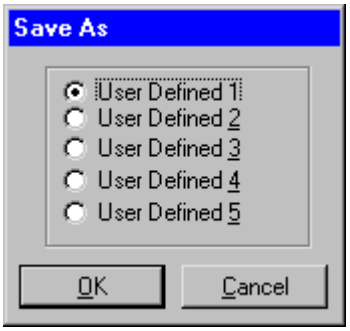
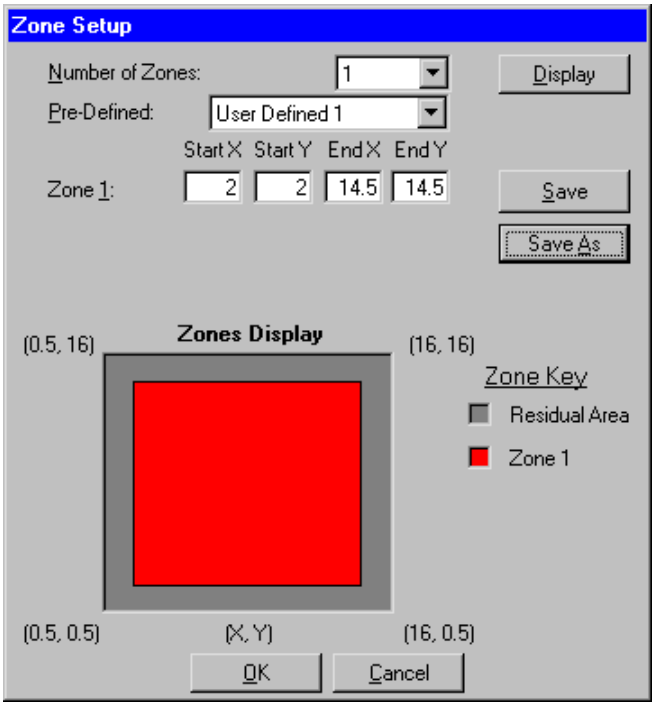


Figure 4-7 - Use of the Residual Area Configuration



The Zone Setup screen requires the following information:

Table 4-3 - Zone Setup for Data Analysis

Item	Description
Number of Zones	This pull down window allows the selection of 1 – 4 zones. There are actually five possible zones of analysis, the number selected with this item and a residual zone.
Pre-Defined	A number of pre-defined zones present with each number of zone settings (Figure 4-5). These pre-defined settings may be used, or different user defined settings may also be used.
Start X	The starting X-coordinate for the zone being defined.
Start Y	The starting Y-coordinate for the zone being defined.
End X	The ending X-coordinate for the zone being defined.
End Y	The ending Y-coordinate for the zone being defined.
Display	Displays the zones that have been defined in the Zone Display on the bottom of the screen.
User-Defined Settings	Using the above text boxes to enter an analysis configuration, these settings may be saved by clicking the Save As button (Figure 4-6 and Figure 4-7).
Save	This button allows saving changes that may have been made with the User-Defined Settings.
Save As	Associated with User-Defined settings above.
OK	Closes the Zone Analysis Select Definitions window.
Cancel	Exits the zone setup screen without incorporating any of the settings.

Rotational Behavior Calculations

With the MED Rotational Analysis Setup, the user can select from three pre-defined settings to analyze for large, medium, and small clockwise and counterclockwise rotations. We have also provided user-definable quadrant, radius and onset/backtrack tolerance settings to provide flexibility for subject/treatment specific analyses.

The preset values analyze for small (Figure 4-10), medium (Figure 4-9), and large rotations, up to the entire diameter of the chamber (Figure 4-8). This ability to classify rotations based upon their size (actually maximum radius) was initiated in light of current research examining rotations as wide or pivotal. Remember, the OFA system tracks the center of the animal, therefore the rotations considered are ambulatory circles, the path of which is defined by the radius, number of segments, and segment limits (forward and reverse). Bear in mind that rotations around the animal's center (i.e. rotations for chasing its tail) cannot be detected by this system.

Figure 4-8 - Large Circles Values to Analyze Clockwise and Counterclockwise Rotations.

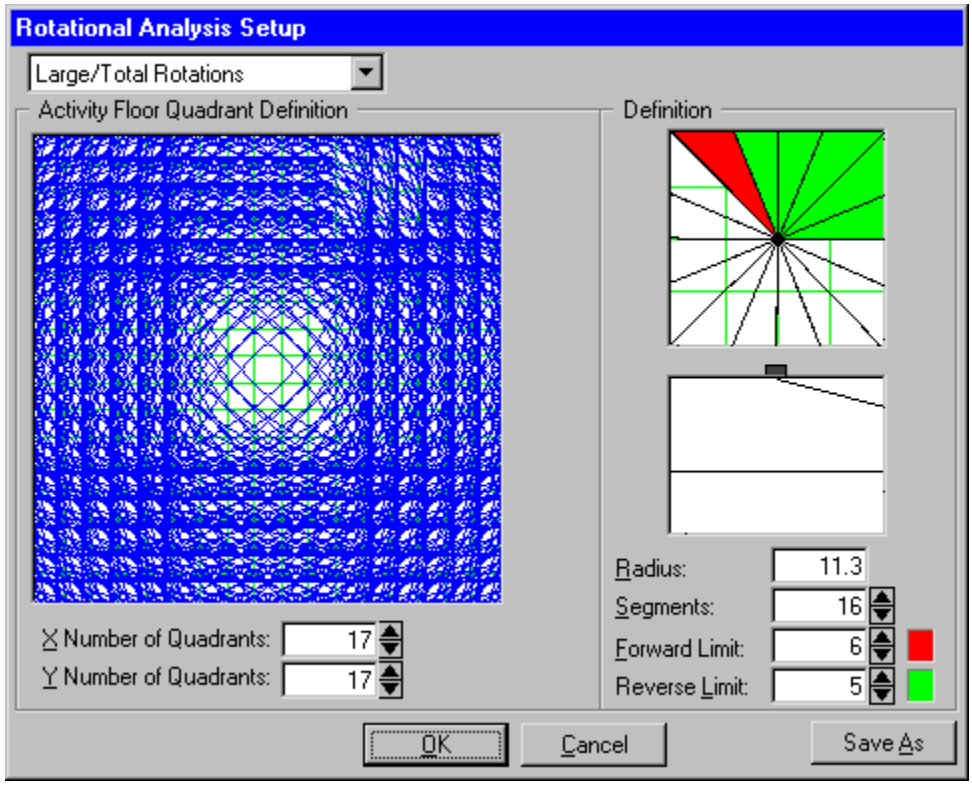


Figure 4-9 - Rotational Analysis for Medium Radius (6.5 Photobeams)

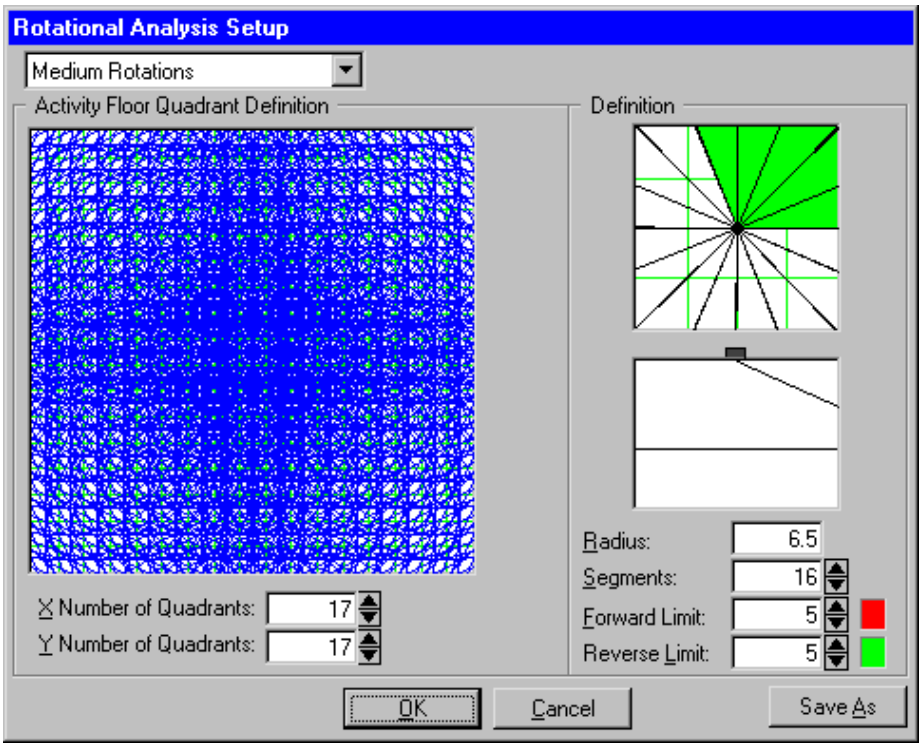
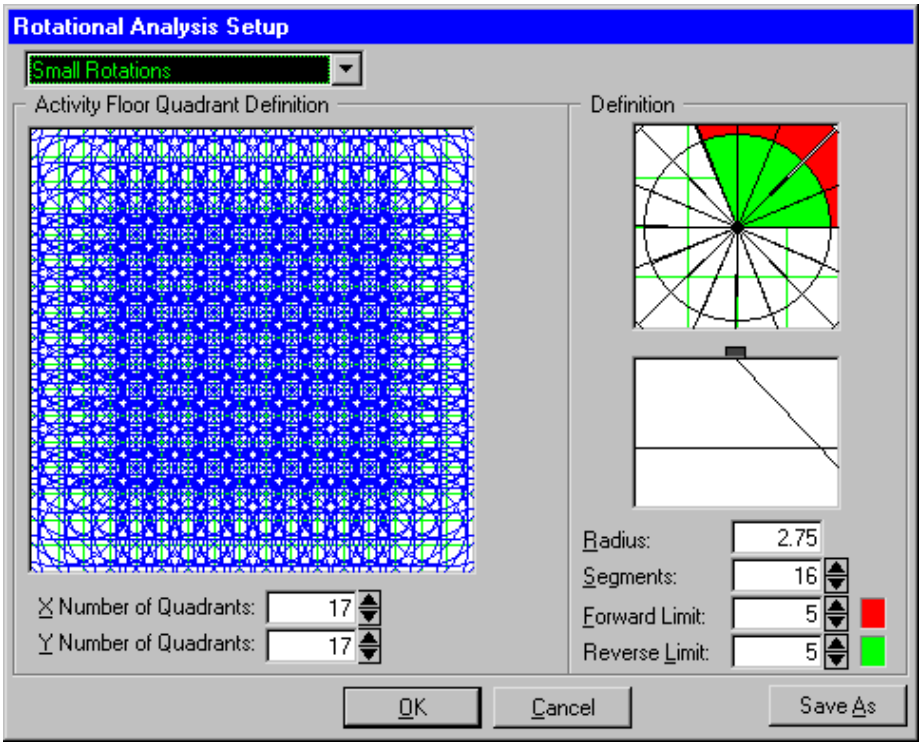


Figure 4-10 - Rotational Analysis for Small Radius (2.75 Photobeams)



It is recommended that the preset analysis settings be used, however, the Rotational Analysis Setup window has three display windows (Figure 4-8 - Figure 4-10) for user-defined rotational analysis configurations. The top left window displays the quadrant and maximum radius information in such a way as to allow the user to view and understand what changes with the quadrant and maximum radius do to the analysis. As the numbers in the setup boxes change, the corresponding display window changes accordingly. The top right window displays, in a pie chart, the number of Segments, single pie slices that allow the user to set "degrees of freedom" for the Forward Limit (red pie slices) and Reverse Limit (green pie slices). These settings tell the software how far a subject must move in order to start looking for a rotation and how far a subject may back track and not start logging a rotation in the opposite direction. This "tolerance" has enabled us to get very reproducible results.

The following information is required to run Rotational Analysis:

Table 4-4 - Rotational Analysis Continued

Item	Description
X Number Of Quadrants	Divides the chamber into the specified number of X quadrants. If the number of X and Y quadrants to 3 is set to 3, then the picture in the left hand window will look like a Tic-Tac-Toe board and four intersections will have been created. Each intersection will have a circle created around it. The size of the circle is determined by the Radius (see below).
Y Number Of Quadrants	Divides the chamber into the specified number of Y quadrants.
Radius (number of photo beams)	Determines the size of the circle around each intersection. The animal must stay within the circle for the entire rotation or it will not count. Therefore small radiuses will catch only small rotations and large radiuses will catch larger rotations.
Segments	Determines how many pie slices to divide each circle into.
Forward Limit	The Forward limit determines how many pie slices forward the animal can move in one tick (usually 50ms). It is designed to help detect if the animal is crossing through the center of the circle. : Segments is set to 8 and Forward Limit is set to 4. If the animal starts in pie slice 1, it can safely move to pie slices 2, 3, 4 (clockwise rotation) or 8, 7, 6 (counterclockwise rotation) and still be considered in a rotation. If the animal moves through the center of the circle to pie slice 5, then it will no longer be considered a rotation.
Reverse Limit	Determines how many pie slices the animal can move in the reverse direction in one tick (usually 50ms) before the software starts to look for a circle in the opposite direction. It also helps detect if the animal crossed the center in the opposite direction. : Segments is set to 8 and Reverse Limit is set to 4. If the animal starts in pie slice 1 and then goes into pie slice 2, then the animal can safely to into pie slices 1, 8, and 7 in the reverse direction before the rotation is thrown out and a new one is started in the opposite direction. If the animal goes through the center of the circle into pie slice 6, then the rotation is not counted and a new one is started from pie slice 6.

Item	Description
Pre-Defined Settings	We have included three pre-defined settings for Large, Medium, and Small rotational behavior monitoring. The Large rotations settings are 17 x 17 quadrants, 11.3 Radius, 16 Segments, 5 Forward Limit segments, and 5 Reverse Limit segments. Medium rotations use a Radius of 6.5 photo beams. Small rotations are up to 2.75 photo beams in radius.
User-defined Settings	Like the Zone Analysis Definition window, the Rotational Behavior Analysis utility allows the saving of the settings determined above as User-Defined (Figure 4-6).
Save As	Associated with User-Defined settings above.
OK	Closes the Rotational Behaviors Select Definitions window.
Cancel	Exits the Rotational Behaviors setup screen without incorporating any of the settings.

Using the Rotational Analysis Utility

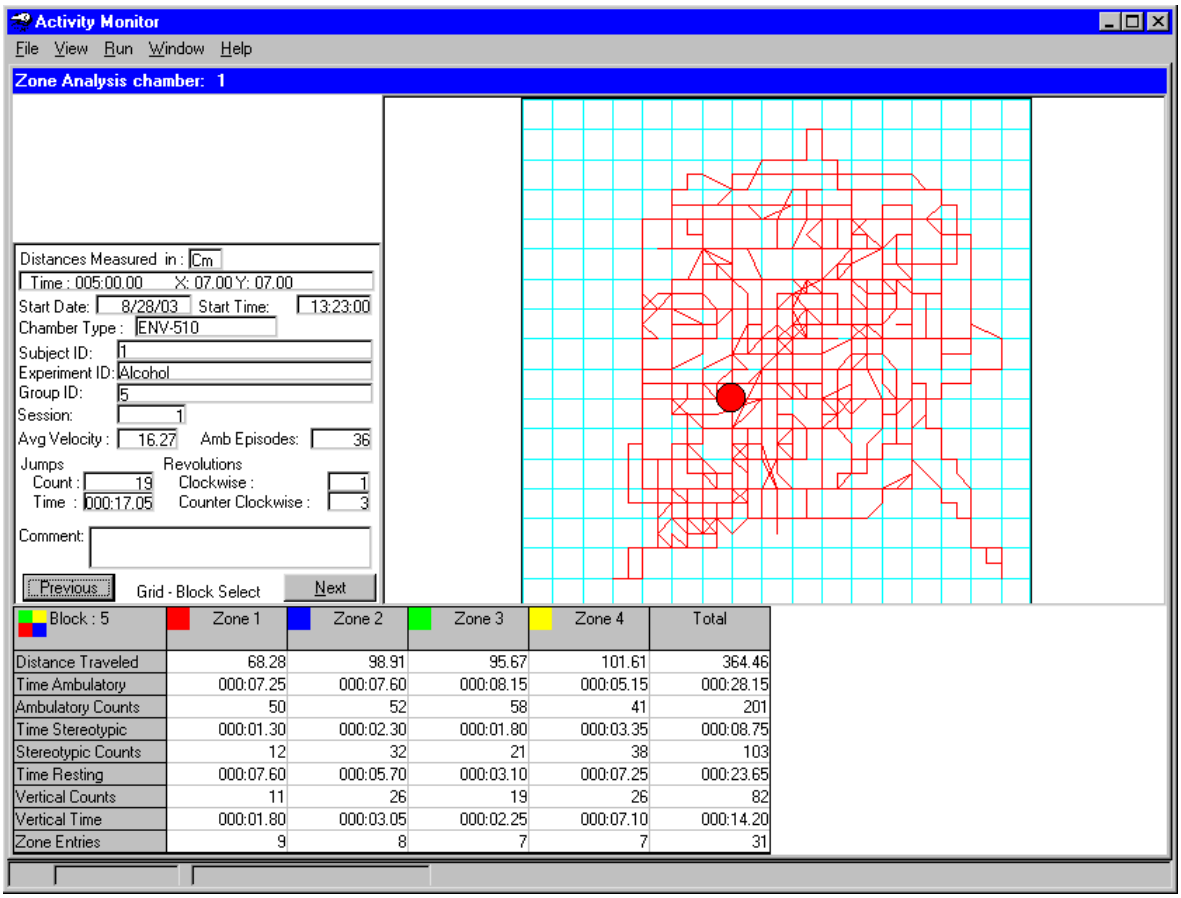
The preferred method of using the rotational analysis is to use a control group to first determine the control groups' rotational behavior. Once their behavior has been determined, it is then possible to see how other groups' rotational behavior compares to the control. Note that when comparing rotational behavior, the exact same parameters must be used for the comparison. For example, the effects of intoxication might be compared by looking for large, slow-moving circles. In such a case the radius should be set high, the number of segments should be set very high, and the forward and reverse limit should be set low. This will detect large, slow moving circles and allow comparisons between a control group and other animal groups.

Note that the radius is defined in beams. In an ENV-510 chamber, the beams are spaced 5/8 of an inch apart. So if the radius is 6.5 beams, it is equivalent to 6.5 * 5/8 = 4.0625 inches. In an ENV-515 chamber, the beams are spaced 1 inch apart. So a radius of 6.5 beams would be equal to 6.5 inches.

Save/Load Protocol

After all of the Data Analysis Setup information has been entered, the established analysis protocol can be saved. This allows the user to use the same settings to analyze all pertinent data sets by loading this protocol prior to data analysis. This protocol should be named such that the name represents, in some manner, the function. Subsequent data analysis sessions can be expedited by simply loading the named protocol and by clicking Analyze. Below is a graphic of the Data Playback Screen. The data may also be analyzed and the subject plot viewed in the process (Figure 4-2, Table 4-1).

Figure 4-11 - Data Playback Screen Analysis Completed



Block : 5	Zone 1	Zone 2	Zone 3	Zone 4	Total
Distance Traveled	68.28	98.91	95.67	101.61	364.46
Time Ambulatory	000:07.25	000:07.60	000:08.15	000:05.15	000:28.15
Ambulatory Counts	50	52	58	41	201
Time Stereotypic	000:01.30	000:02.30	000:01.80	000:03.35	000:08.75
Stereotypic Counts	12	32	21	38	103
Time Resting	000:07.60	000:05.70	000:03.10	000:07.25	000:23.65
Vertical Counts	11	26	19	26	82
Vertical Time	000:01.80	000:03.05	000:02.25	000:07.10	000:14.20
Zone Entries	9	8	7	7	31

CHAPTER 5
Inserts for Open-Field Activity

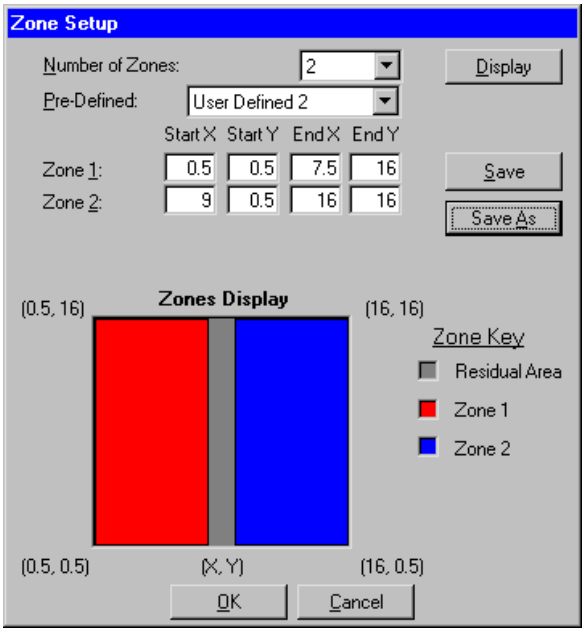
Dark Box Insert (Light/Dark Test)

NOTE: Inserts are not currently available for the VTI system.

Dark Boxes are available for both the mouse (ENV-511) and rat (ENV-516) sized activity chambers. The two-compartment Light/Dark Test (Light/Dark Conflict Test) is one of the classic indices of anxiety and is easily incorporated into the system while examining other components of locomotor activity. The Dark Box Insert is opaque to visible light and designed to cover 1/2 the area of the OA Chamber. There is an opening into the Dark Box that allows the subject to pass freely, but is sufficiently small to minimize the amount of light that enters the darkened area. I/R Array height is the same as that for general open-field monitoring.

The time spent in the light area or dark area, and entries into each zone, is determined using the Zone Analysis utility with two zones. The residual zone may be placed between the two zones to minimize artifact of "bouncing" or "flickering" as a subject enters or leaves a zone and to examine time in transition between the two zones. Match the two zones with the two areas of the Light/Dark test and analyze the data. Factory configured chambers are set up so that coordinate (0.5, 0.5) is at the opposite corner from the ENV-520 controller box and coordinate (16, 16) is in the same corner as the controller box. For complete instructions see Zone Analysis.

Figure 5-1 - Zone Analysis Setup for the Light/Dark Insert



Two Chamber Place Preference

Two Chamber Place Preference is used for conditioned place preference paradigms. Like the Dark Box listed above, the Two Chamber Place Preference Insert is simply a box that slides into the chamber. After the box has been placed into the open-field environment the I/R array heights will need to be adjusted to ensure that the subjects are tracked properly (Chapter 1).

The insert covers the entire area of the chamber. The outside of the box is constructed of clear polycarbonate. Stickers, paper, or any easily removable material may be applied to the outside of these clear walls to provide distinct visual stimuli to maximize contextual differences; however, do not cover the photo beams. Each side of the box has a different floor, grid rods and/or wire mesh. The lid is hinged to allow easy subject insertion and removal. A manual guillotine door is provided that allows the subject to pass freely, if so desired. As described above, the software can parse the session data into zones and determine the amount of time that a subject spends in either area. Applications for this insert include two chamber Conditioned Place Preference tests and other two chamber contextual protocols. Two Chamber Place Preference Inserts are available for the mouse and rat sized chambers.

Hole Board Task Floor

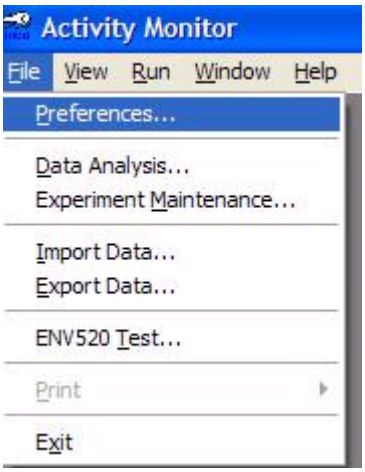
The Hole Board Task has been used for over ten years as a spatial orientation learning test, a short-term and long-term memory test, and an attention and curiosity monitoring protocol/device. The Hole Board Task Floor insert is placed into the open-field activity arena. The Hole Board Floor insert has 16 holes (four rows of four, equidistant holes) with an underlying food tray. The I/R Arrays must be attached using the lowest available screw holes. This places the photo-beams between the floor and the tray to detect entries into the holes. Food may be placed into the tray for learning and memory protocols using working and reference memory ratios. A second, non-reward application is to simply place the animal on to the Hole Board insert and monitor hole entries for novelty/curiosity assessment. Typical reward associated paradigms involve habituation, pre-testing protocols and non-habituation, no pre-testing protocols. See Chapter 7 and Appendix VII for more information on the running of this insert.

CHAPTER 6
Setting up an Ambulatory Experiment

The next two chapters will cover how to set up, run, and analyze data. This chapter deals with running an ambulatory experiment, thus covering the procedures used with the OFA system alone or with either the Dark Box insert or the Place Preference insert. The following chapter will deal with how to run an experiment with the Hole Board insert.

The first step is configuring both the Preferences and the Experiment options. First go to **File | Preferences**:

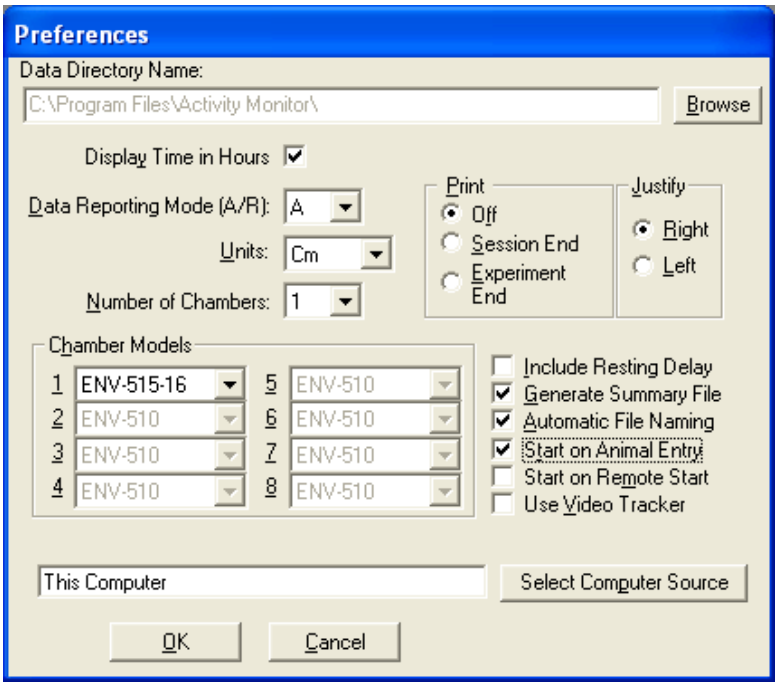
Figure 6-1 - Preferences Menu Item



For the purpose of this example, the system will be configured for an ENV-515 that is equipped with 16 beam arrays that will generate summary files, automatically name the files, and start on animal entry; the rest of this chapter will assume that the same configuration is being used[1]. When the screen looks like the one shown in Figure 6-2, click **OK**:

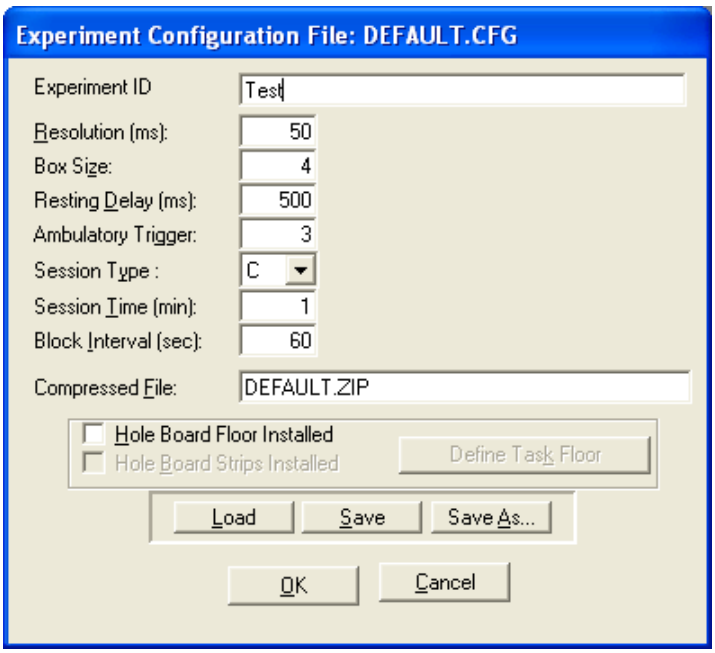
[1] Please note, if a mouse chamber is being used, set the chamber to ENV-510, but keep all other settings the same.

Figure 6-2 - Preferences Screen



Next the experiment must be configured. Select **Run | Open Experiment | Add New Experiment** and select the settings shown in Figure 6-3.

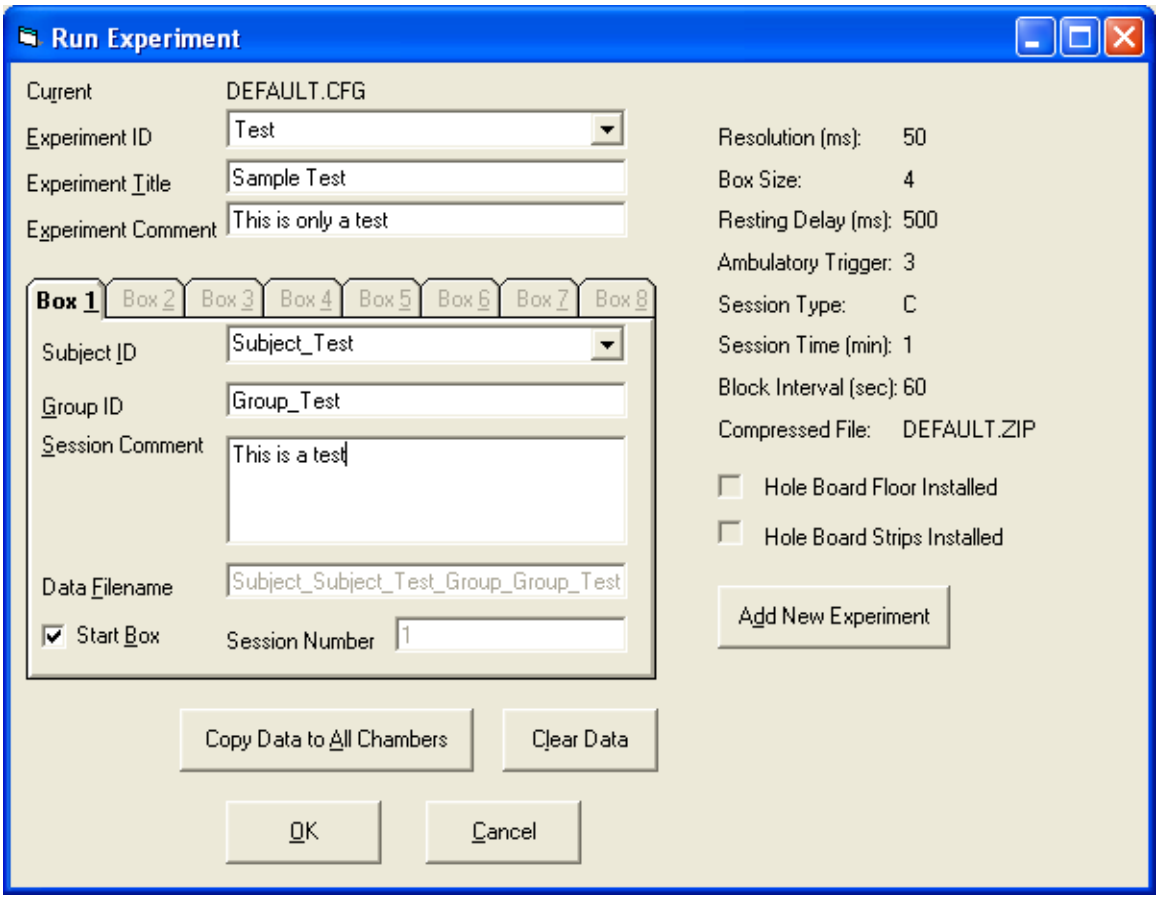
Figure 6-3 - Configuration Screen



When the preceding information has been entered, click on the **Save As** button and save as TEST.CFG[2]

Now the following on the screen will appear:

Figure 6-4 - Screen that Loads/Starts Experiment

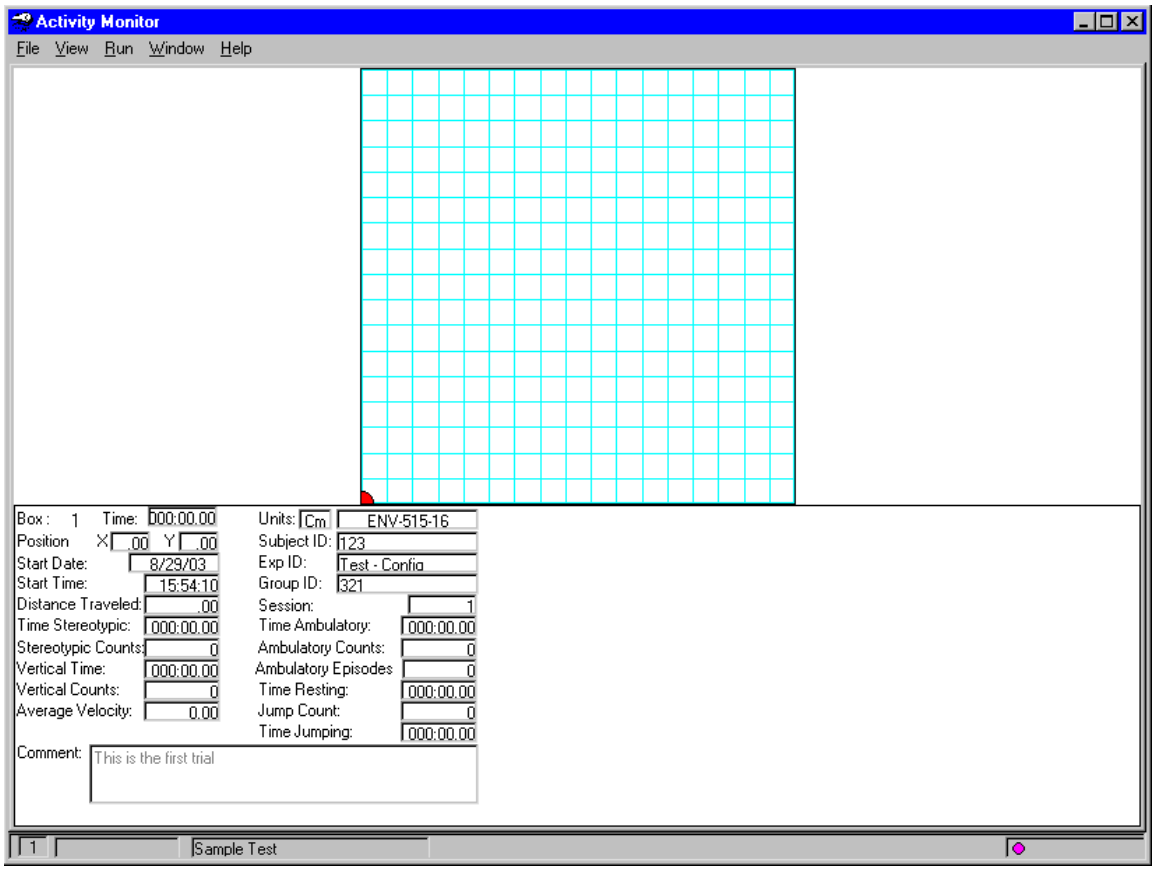


Be sure that **Start Box** is checked and then select the **OK** button.

If everything was done correctly, the screen should now look like this:

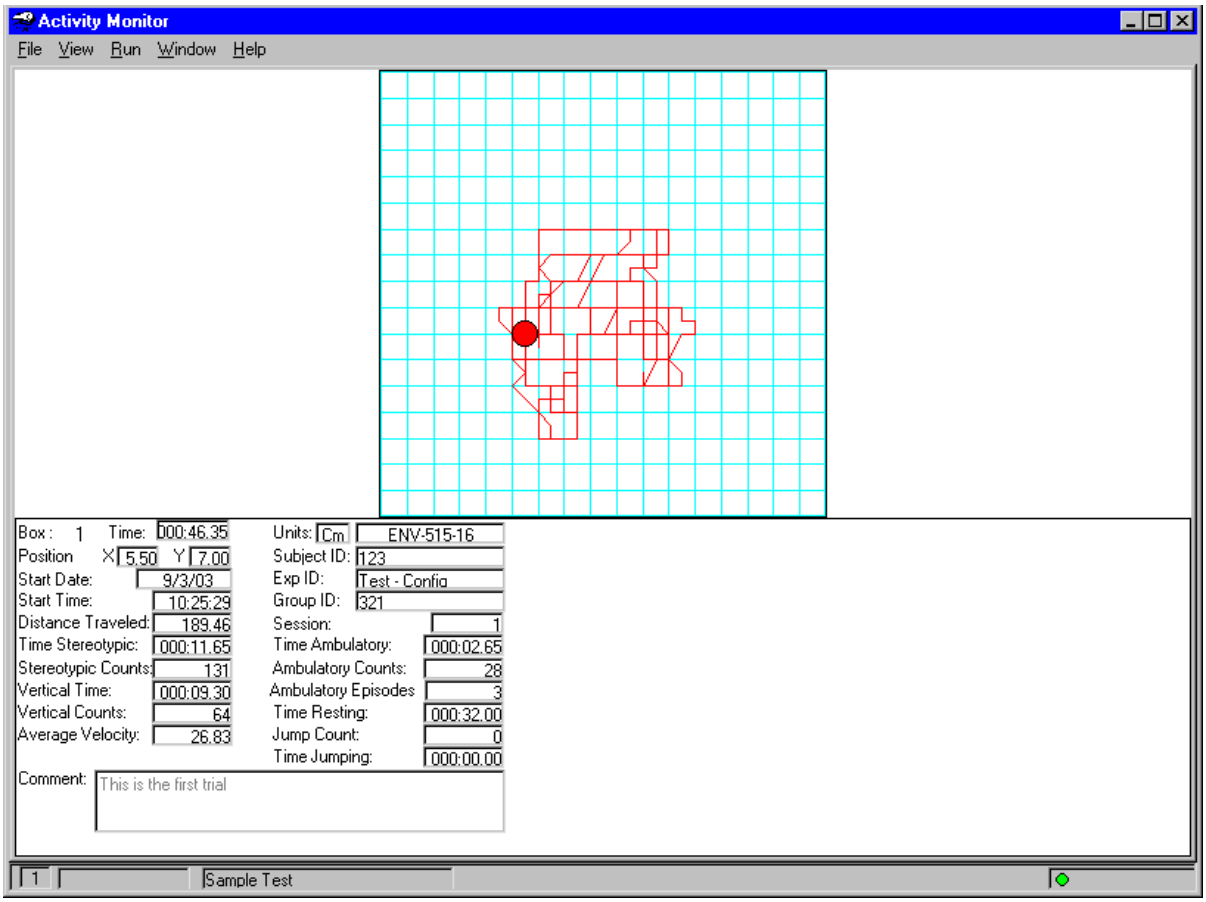
[2] By saving this file as "TEST.CFG," the naming of files will remain constant throughout this chapter. When a "standard" experiment is set up, however, it is recommended that it be saved as the default (DEFAULT.CFG). Doing this will ensure that upon opening the Activity Monitor software the experiment that is ready to run is the desired experiment.

Figure 6-5 - Run Time Screen in Wait Mode



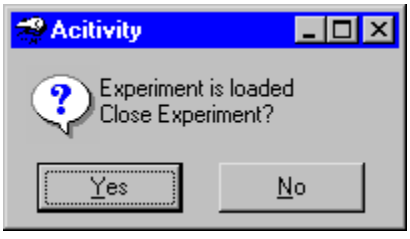
The chamber was configured only to start collecting data upon animal entry. Note the purple light at the bottom, right hand corner of the screen. This signifies that the box is loaded and awaiting an animal. At this point place an animal into the chamber and the screen will look like the image shown in Figure 6-6:

Figure 6-6 - Run Time Screen as Experiment Runs



Allow the experiment to run its course. When the designated time is up, in this case three minutes, the program will stop collecting data and the plot will stop moving with the animal, despite the fact that the animal is still moving. Now go to **Run | Close Experiment** the following screen will appear:

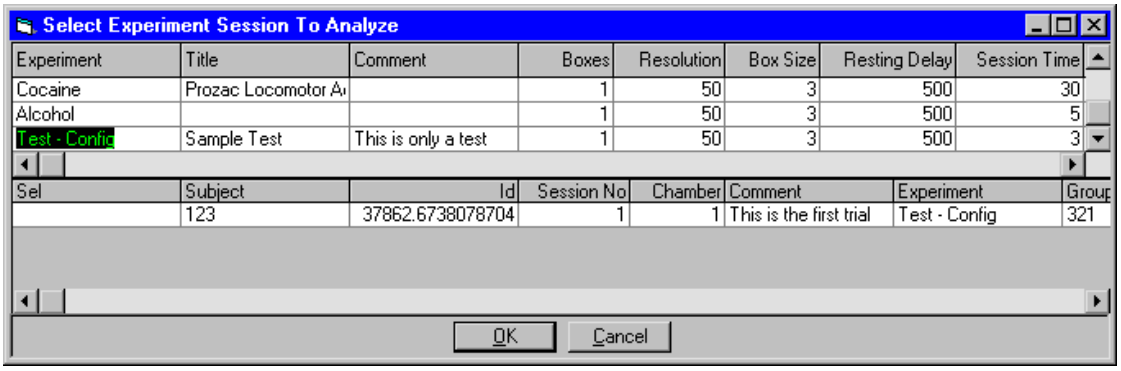
Figure 6-7 - Close Experiment Dialog



Click **Yes** to exit the run time screen.

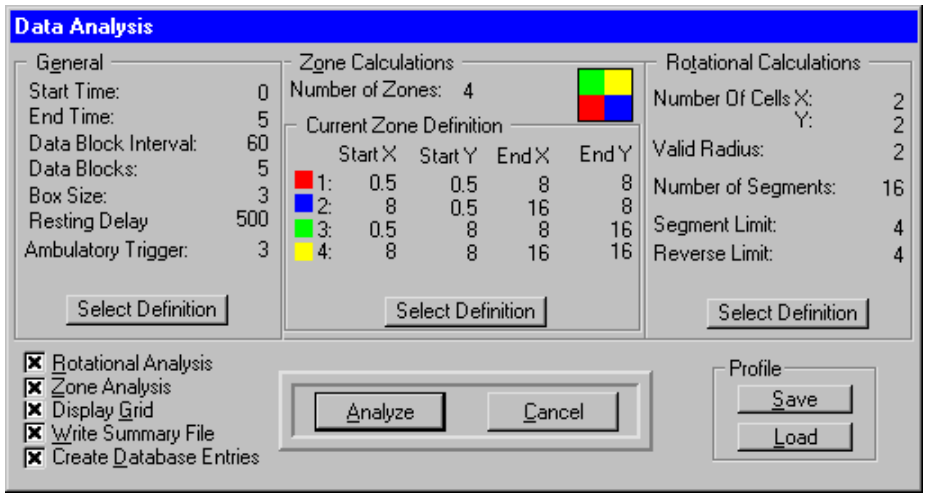
Now the data that has been collected, it is ready to be analyzed. Go to **File | Data Analysis**. A screen similar the following will appear:

Figure 6-8 - Data Analysis Database Window



The top half of the screen displays all of the available experimental databases available. The bottom half is the subjects ran, sorted by ID. After clicking on the **Test - Config** row on the top half, select the proper subject on the bottom half. Clicking the row of the subject to be analyzed will do this. Since there is only one subject listed in this example, this is a moot point.

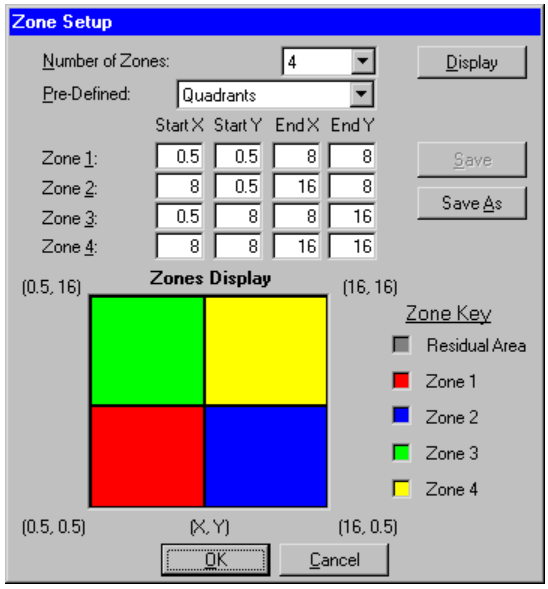
Figure 6-9 - Data Analysis Option Screen



The Data Analysis screen is shown in Figure 6-9. Before proceeding, be sure that all boxes in the lower left hand corner are selected, as shown. This will enable all of the features of the Data Analysis portion of the software. Since the information under the "General" section has already been set up the experiment was configured (Figure 6-3), it does not need to be changed.

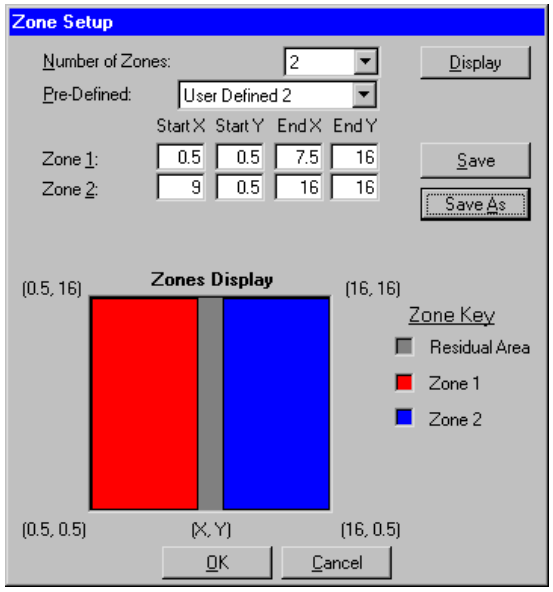
Click on **Select Definition** under Zone Calculations.

Figure 6-10 - Zonal Analysis Screen



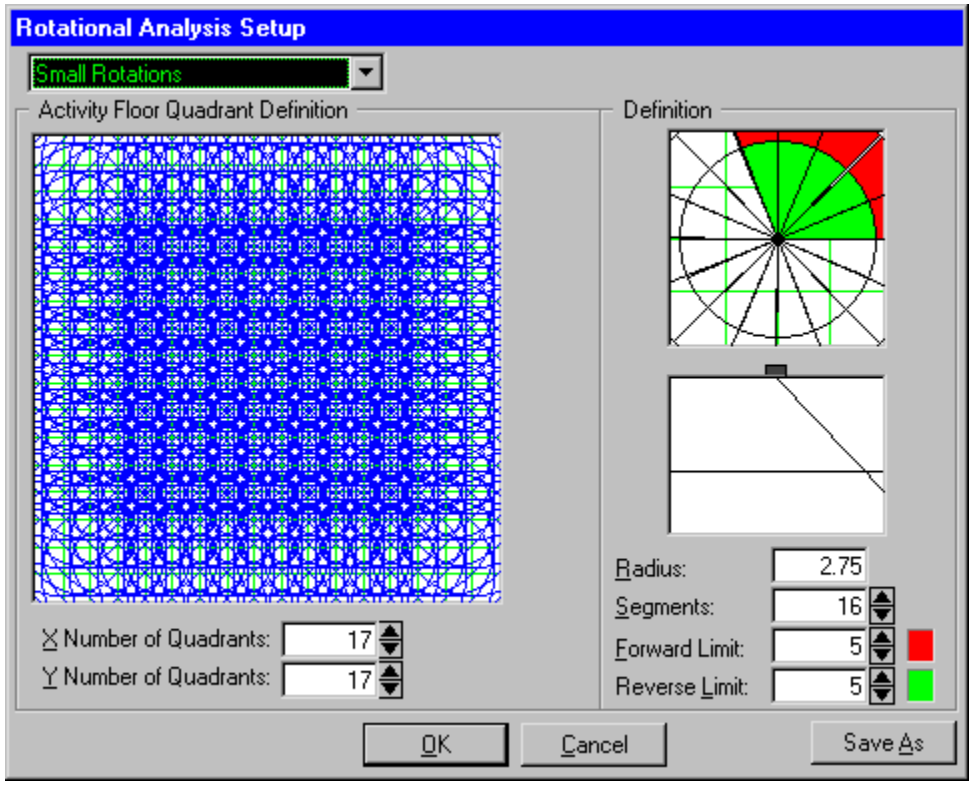
For the purpose of this demonstration, the predefined **Quadrants** zonal analysis will be used. If a light/dark box insert or a place preference insert is being used, this will ensure that distinct data will be collected for each side. In this case, select the configuration shown in Figure 6-11, making sure to click **Save As** not only to save the user defined changes, but also to see the changes on the screen:

Figure 6-11 - Example of Custom Zonal Analysis Screen



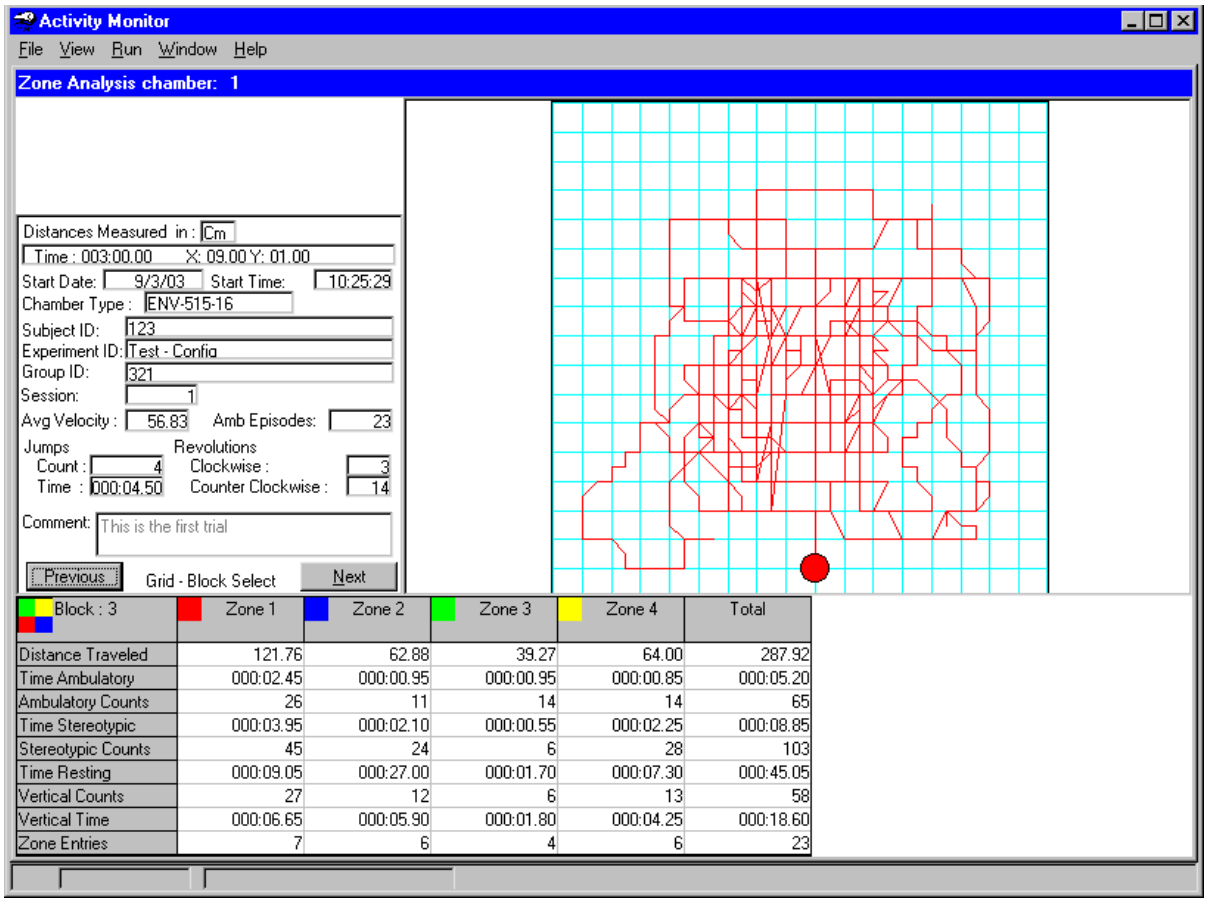
Click **Select Definition** under Rotational Calculations on the main data analysis window.

Figure 6-12 - Rotational Analysis Screen



For the purpose of this demonstration, small rotations using the defined radius, segments, and limits shown above, will be used. Click **OK**, and then click **Analyze** on the main data analysis window.

Figure 6-13 - Analysis Screen



Block : 3	Zone 1	Zone 2	Zone 3	Zone 4	Total
Distance Traveled	121.76	62.88	39.27	64.00	287.92
Time Ambulatory	000:02.45	000:00.95	000:00.95	000:00.85	000:05.20
Ambulatory Counts	26	11	14	14	65
Time Stereotypic	000:03.95	000:02.10	000:00.55	000:02.25	000:08.85
Stereotypic Counts	45	24	6	28	103
Time Resting	000:09.05	000:27.00	000:01.70	000:07.30	000:45.05
Vertical Counts	27	12	6	13	58
Vertical Time	000:06.65	000:05.90	000:01.80	000:04.25	000:18.60
Zone Entries	7	6	4	6	23

The above screen is the post analysis screen. This shows the analysis of all the data that was selected (e.g., revolutions and zonal entries). Clicking on either **Previous** or **Next** will cycle between each of the one-minute blocks to see how the data varied. To see the summary file that was created when the experiment was first run, go to the data directory (unless user changed, it will be C:\Program Files\Activity) and open the file in a text editor (e.g. Notepad):

Subject_123_Group_321_Experiment_Test-Config.Summary

To see the zone analysis file that was just created, open the file:

Subject_123_Group_321_Experiment_Test-Config.Zone

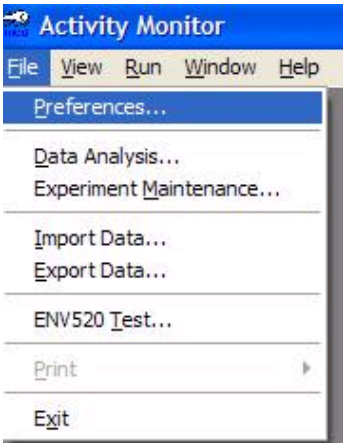
The file was saved in the database (ANALYSIS.MDB); so all data can be opened with a database.

CHAPTER 7
Setting up a Hole Board Experiment

NOTE: Hole Boards are not supported by the VTI system.

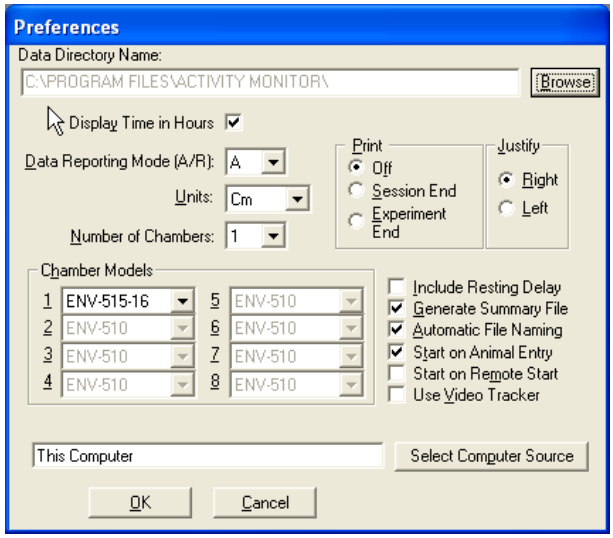
Click **File | Preferences**:

Figure 7-1 - Menu Options for Setup



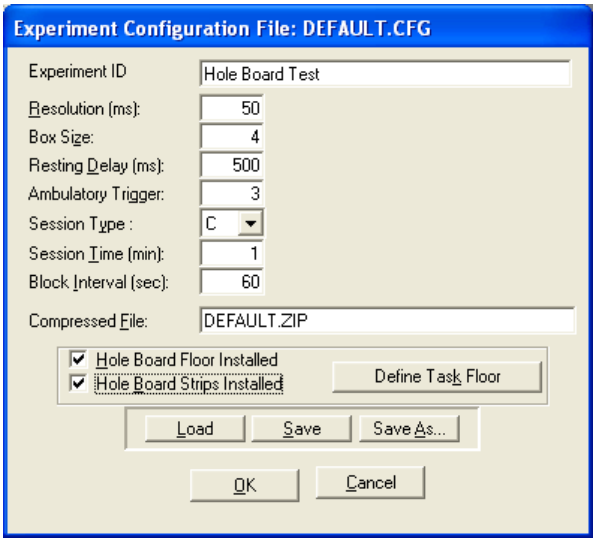
For the purpose of this experiment an ENV-515 will be configured that will generate summary files and automatically name the files; the rest of this chapter will assume that the same configuration was used. When the screen looks like this one, click **OK**:

Figure 7-2 - Preference Screen



Next the experiment will be configured. Go to **Run | Open Experiment | Add New Experiment** and enter the settings shown in Figure 7-3.

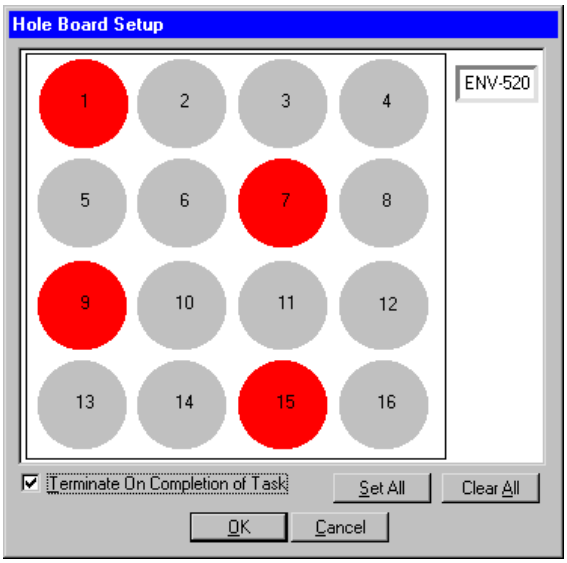
Figure 7-3 - Configuration Screen



Since a hole board experiment is being run, **Hole Board Floor Installed** must be selected. If hole board strips that plug into Z strips (so that both activity and nose poke behavior can be measured) are being used, then click the **Hole Board Strips Installed** box as well. If not, leave this box unchecked.

Next, click on **Define Task Floor**. Enter the following information.

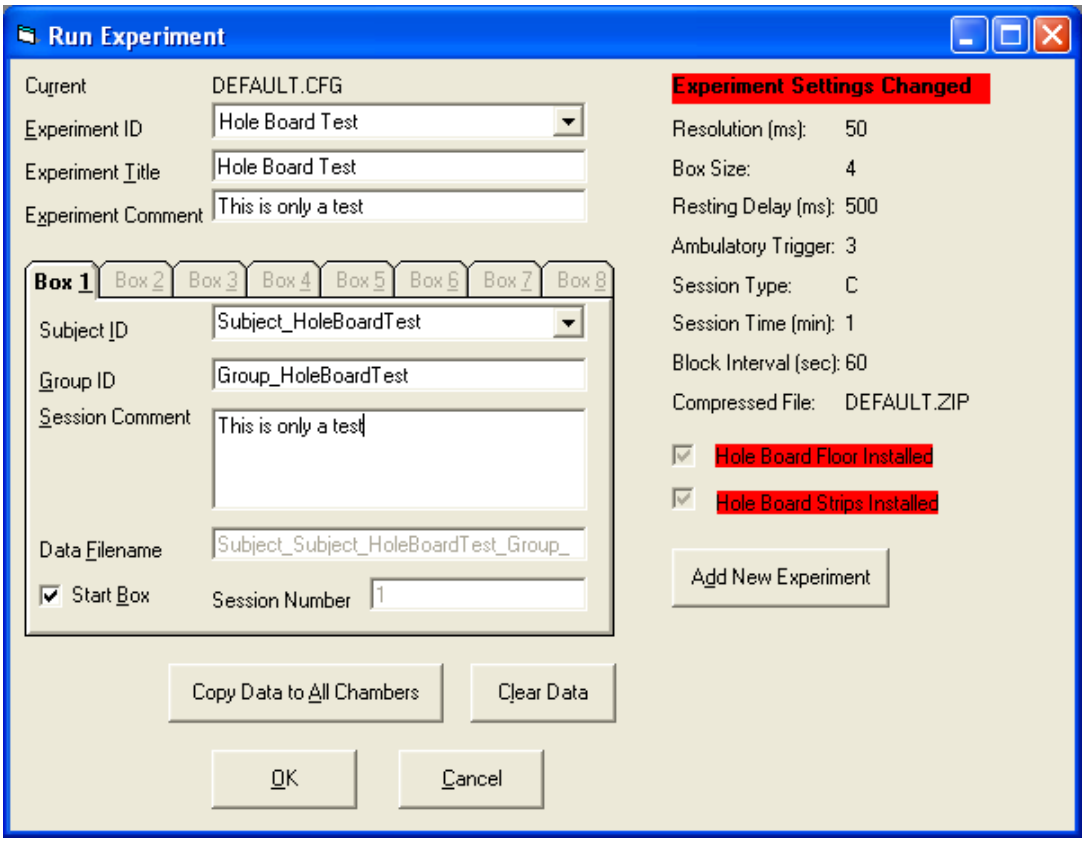
Figure 7-4 - Baited Hole Selection Screen



Click on the appropriate hole to indicate which holes are the target, or baited, holes. Selected holes will be indicated in red. If a hole is inadvertently selected, click it a second time to deselect it. After the four holes listed above have been selected, select **Terminate On Completion of Task**, then click the **OK** button. At the main **Experimental Configuration** window, click the **Save As** button and save it as HOLEBOARD.CFG.

Now go to **Run | Open Experiment**. Enter the settings shown in Figure 7-5:

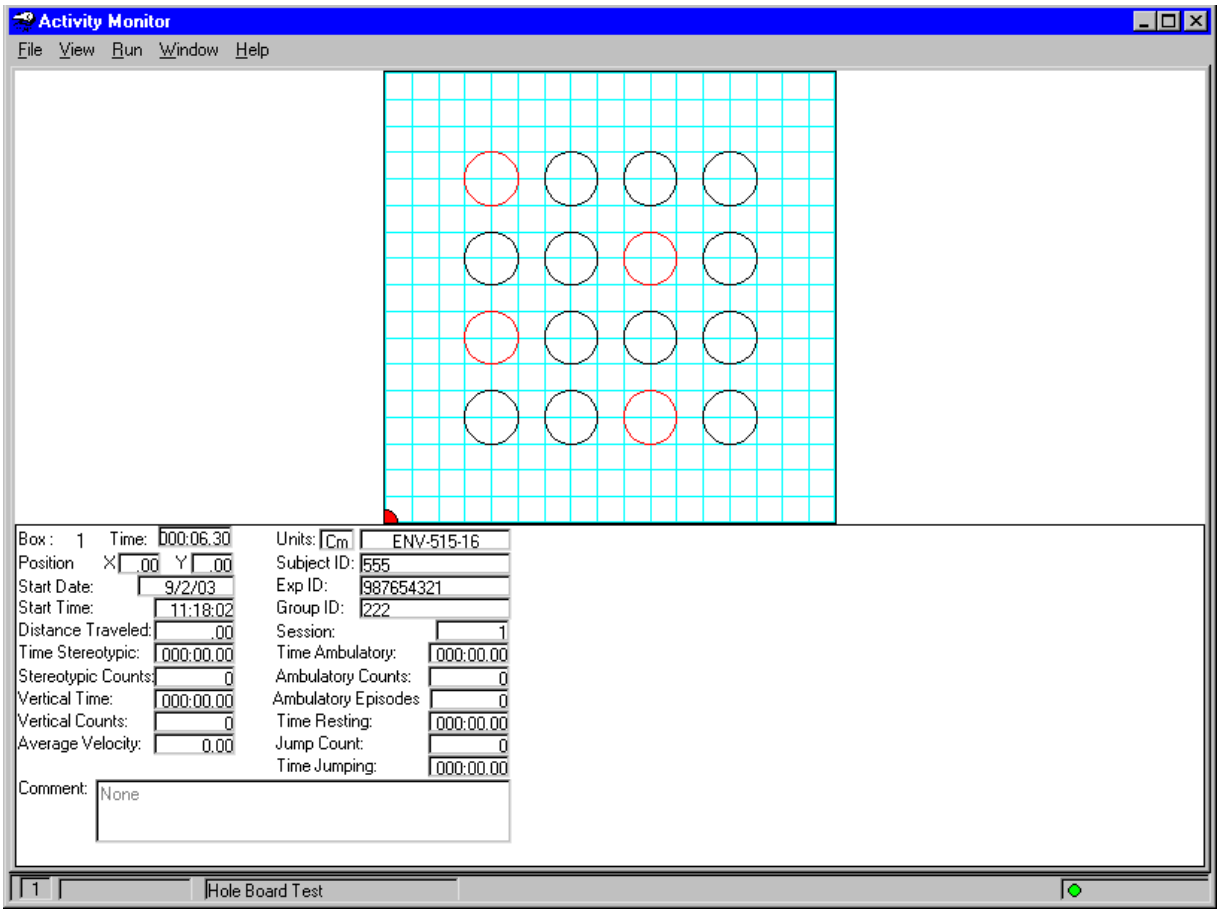
Figure 7-5 - Start Hole Board Experiment Screen



Be sure **Start Box** is selected and click **OK**.

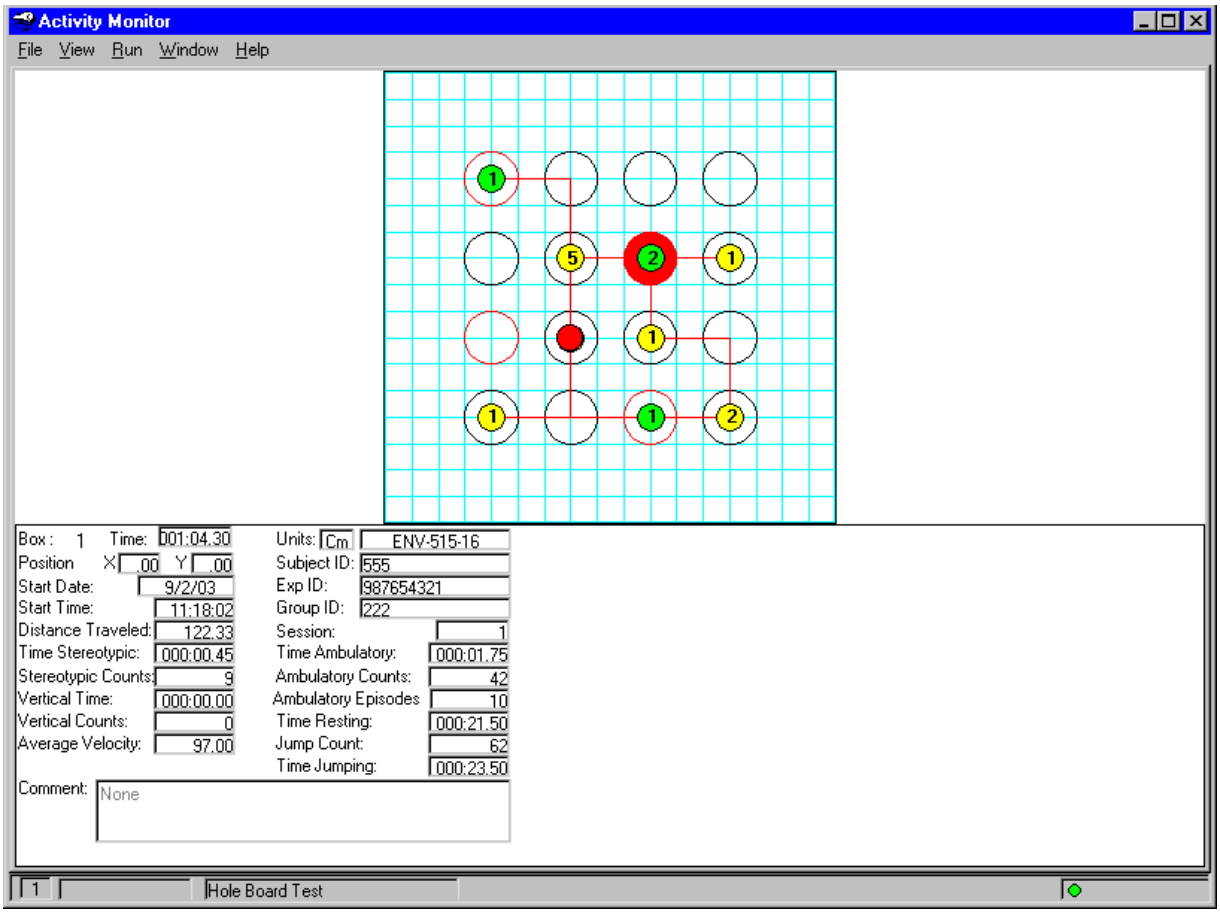
If everything was done correctly, the screen shown in Figure 7-6 should appear.

Figure 7-6 - Run Time Screen at Start



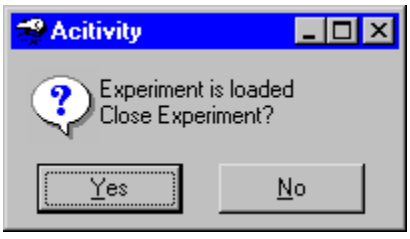
As objects enter the holes, notice that the counts are incremented on the screen, as shown in Figure 7-7.

Figure 7-7 - Run Time Screen while Experiment Runs



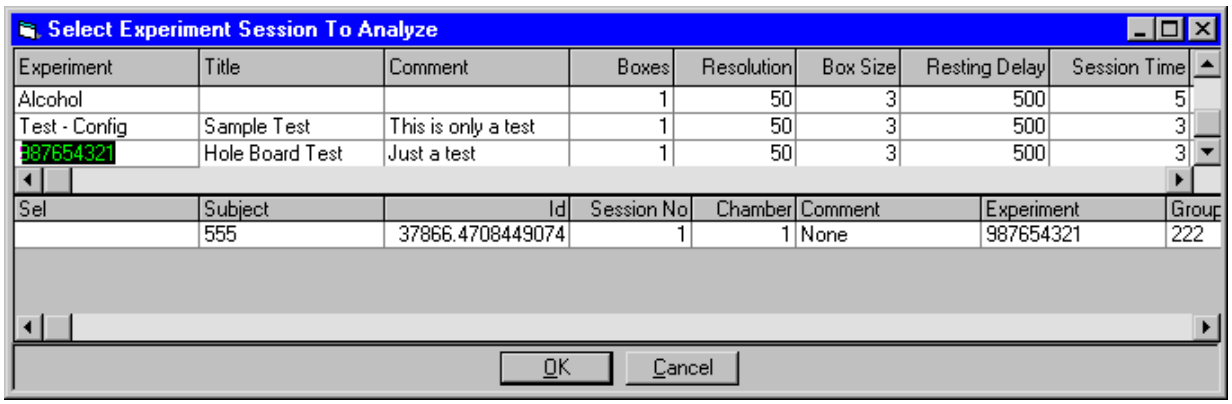
Allow the experiment to run its course (i.e. trigger all four baited holes). At this point select **Run | Close Experiment**. When the screen shown in Figure 7-8 appears, select **Yes**.

Figure 7-8 - Close Experiment Dialog



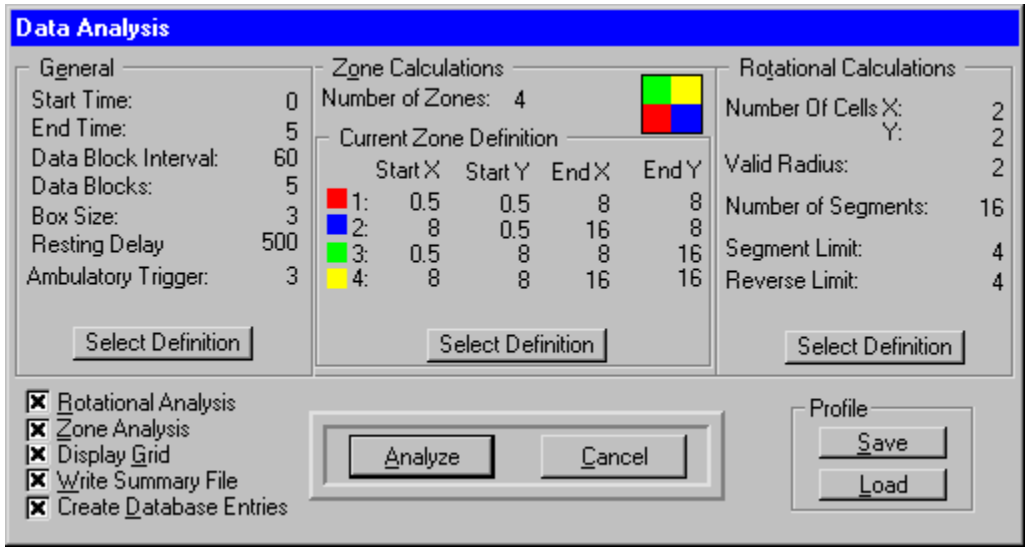
With Activity Monitor Version 5, Data Analysis of saved data may be performed. With previous versions hole board strips needed to be installed in order to complete a Data Analysis. To complete a Data Analysis go to **File | Data Analysis**. The screen shown in Figure 7-9 will appear:

Figure 7-9 - Hole Board Data Set Selection Screen



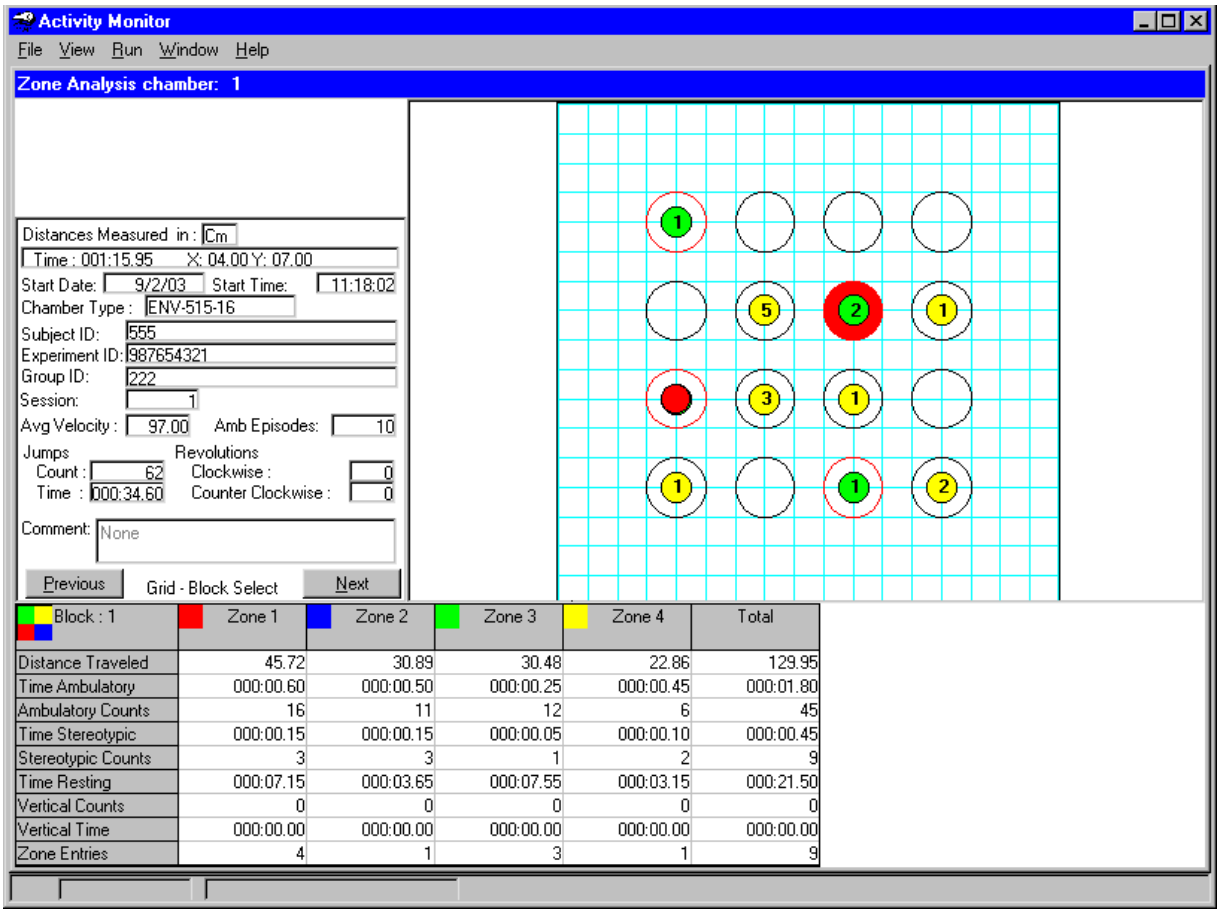
The top half of the screen displays all of the experimental databases available. The bottom half is the subjects ran, sorted by ID. After clicking on the "987654321" row on the top half, select the proper subject on the bottom half. Click the row of the subject to analyze to do this.

Figure 7-10 - Data Analysis Option Screen



The Data Analysis screen is shown in Figure 7-10. Before proceeding, be sure that all boxes in the lower left hand corner are selected, as shown. This will enable all of the features of the Data Analysis portion of the software. For this hole board experiment all options will be left at their default values, so just click on **Analyze** to go to the main data analysis window.

Figure 7-11 - Analysis Screen



Block : 1	Zone 1	Zone 2	Zone 3	Zone 4	Total
Distance Traveled	45.72	30.89	30.48	22.86	129.95
Time Ambulatory	000:00.60	000:00.50	000:00.25	000:00.45	000:01.80
Ambulatory Counts	16	11	12	6	45
Time Stereotypic	000:00.15	000:00.15	000:00.05	000:00.10	000:00.45
Stereotypic Counts	3	3	1	2	9
Time Resting	000:07.15	000:03.65	000:07.55	000:03.15	000:21.50
Vertical Counts	0	0	0	0	0
Vertical Time	000:00.00	000:00.00	000:00.00	000:00.00	000:00.00
Zone Entries	4	1	3	1	9

The above screen is the post analysis screen for hole board data. The red circles indicate the selected task holes, the green numbers indicate entries into the task holes, the yellow numbers indicate entries into non-task holes, and the solid red circle indicates repeated entries into a task hole. If the hole board strips are installed, then the screen can also show zonal data and revolution data. Clicking on either **Previous** or **Next** will cycle between each block. However, since only one three-minute block was defined for this example, the data will not change. To see the summary file that was created when the experiment was first run, go to the data directory (unless User changed, it will be C:\Program Files\Activity) and open the file in a text editor (e.g. Notepad):

Subject_555_Group_222_Experiment_987654321.Summary

To see the zone analysis file that was just created, open the file:

Subject_555_Group_222_Experiment_987654321.Zone

In this example the file was saved in the database (ANALYSIS.MDB); so all data can be opened with a database.

APPENDIX I
File Naming and File Types

File Naming

Summary and analyzed data files may be generated by the system, and will quickly fill the directory. Because of this, it is a good idea to know how each file is named. A file name is automatically generated based upon the Experiment ID, Subject ID, and Group ID entered into the Run Experiment setup and run screen.

There are four types of data files. Three are ASCII text files and the fourth is the database files, with linked data contained in EXP.MDB and ANALYSIS.MDB.

Summary data files contain a SUMMARY extension like the following, Subject_1_Group_1_Experiment_1.Summary. Exporting data generates a Subject_1_Group_1_Experiment_1.Export filename.

Analyzed data files are named Subject_1_Group_1_Experiment_1.Zone.

File Types

Figure A1.1 - File Types

Name	Size	Type	Modified
Data		File Folder	8/26/03 3:19 PM
ActivDll.dll	44KB	Application Extension	4/4/03 10:58 AM
Activity.exe	1,212KB	Application	4/4/03 3:24 PM
Activity.hlp	967KB	Help File	12/20/02 5:19 PM
Activity.ini	1KB	Configuration Settings	9/2/03 1:19 PM
Analysis.ldb	1KB	LDB File	9/2/03 1:09 PM
Analysis.mdb	176KB	Microsoft Access Application	9/2/03 1:09 PM
Default.cfg	1KB	CFG File	8/29/03 3:24 PM
Default.pro	1KB	PRO File	9/2/03 1:19 PM
Default.zip	12,809KB	VisualZIP Archive	9/2/03 11:26 AM
Exp.ldb	1KB	LDB File	9/2/03 11:12 AM
Exp.mdb	484KB	Microsoft Access Application	9/2/03 11:49 AM
Exp.wid	1KB	WID File	9/2/03 10:13 AM
Holeboard.cfg	1KB	CFG File	9/2/03 10:13 AM
Subject_123_Group_321_Experiment_Test-Config.Summary	2KB	SUMMARY File	9/2/03 9:29 AM
Subject_123_Group_321_Experiment_Test-Config.Zone	7KB	ZONE File	9/2/03 9:29 AM
Subject_555_Group_222_Experiment_987654321.Summary	3KB	SUMMARY File	9/2/03 11:19 AM
Subject_555_Group_222_Experiment_987654321.Zone	6KB	ZONE File	9/2/03 11:55 AM
Test.cfg	1KB	CFG File	8/29/03 4:04 PM

Above are the file types used with the Activity Monitor system. From top to bottom, each of the file types are described below:

1. Data subdirectory. It is a good idea to store the data in a separate folder.

2. ActivDll.dll. Library file used by the Activity program.

3. Activity.exe. The executable file that runs the show.

4. Activity.hlp. The on-line help file.

5. Activity.ini. Configuration file used to save the User Preferences.

6. Analysis.ldb. This file contains instructions for Analysis.mdb.

7. Analysis.mdb. This file contains the analyzed data in a database.

8. Default.cfg. This file contains the experiment specific parameters required to sample and process data during acquisition.

9. Default.pro. This is an analysis profile that contains the instructions needed by the software to do a specific, saved, and defined (by the user) analysis of the data.

10. Default.zip. THIS IS THE MOST IMPORTANT FILE IN THE ACTIVITY DIRECTORY. THIS FILE CONTAINS ALL OF THE RAW DATA THAT WAS RECORDED DURING THE EXPERIMENTS. BACKUP THIS FILE OFTEN. Within this file is a 01012000.A01 - *.Z99 file for every subject run or imported. This name denotes month, day, year, and a unique identifier suffix (A01 - Z99). If 10 subjects are run, three times a day for 3 days, there would be three sets of files with the same month, day, year.A01 - A30. The information necessary for the software to discern which animal the file relates to in the file itself.

11. Exp.ldb. This file contains instructions for Exp.mdb.

12. Exp.mdb. This is the database file created the very first time that an experiment is entered, run a few subjects and close that session. Within this file are all of the pertinent header categories, summary data, block data, and specific session file ID's that link everything together. This information is linked to the analyzed data information in Analysis.mdb via Subject ID, etc. Cross tabulating is fairly straightforward and simple to; however, it may be more efficacious to perform SQL queries, which could require some programming help.

13. Exp.wid. This file contains the instructions that define the column widths for the various tabular screens.

14. Subject_123_Group_321_Experiment_Test-Config.Summary. This file is a summary data file for Subject 123 of Group 321 in Experiment Test-Config.

15. Subject_123_Group_321_Experiment_Test-Config.Zone. This is an analyzed data file for Subject 123 of Group 321 in Experiment Test-Config. Any time that an analysis is done on this subject's data, it is appended to the same file.

APPENDIX II
Available Data

Summary Data

The summary data filenames end with the SUMMARY extension. Summary data files can use either the Relative or Absolute data formats. Both formats are shown below.

```
Printed : 09/03/2003 10:28:34

                              Activity Summary, 5.10
                              ================

Experiment Title            : Sample Test
Experiment Comment          : This is only a test

Resolution (ms)             : 50
Box Size                    : 4
Resting Delay (ms)          : 500
Ambulatory Trigger          : 3
Session Type                : C
Session Time (min)          : 3
Actual Run Time             : 003:00.00
Data Save Interval (sec)    : 60
Start on Animal Entry       : Yes

Raw Filename                : 09032003.C0
Chamber Number              : 1
Chamber Type                : ENV-515-16
Units                       : Cm

Hole Board Installed        : No
Session Comment             : This is the first trial

Subject ID                  : 123
Experiment ID               : Test - Config
Group ID                    : 321
Session No                  : 1
Data Filename               : Subject_123_Group_321_Experiment_Test-Config.Summary

Start Date                  : 9/3/03
Start Time                  : 10:25:29

Detail Reporting Mode       : Absolute

Dist.   Time      Amb.   Time      Ster.  Time      Vert.  Vert.     Session
Trav.   Amb.      Cnts.  Ster.     Cnts.  Rest.     Cnts.  Time      Time
======= ========= ====== ========= ====== ========= ====== ========= =========
 189.46 000:02.65     28 000:11.65    131 000:45.70     64 000:09.30 001:00.00
 538.84 000:11.75    116 000:23.75    271 001:20.90    134 000:33.20 002:00.00
 826.76 000:16.95    181 000:32.60    374 002:05.95    192 000:51.80 003:00.00

Jump    Jump      Average    Ambulatory Session
Counts  Time      Velocity   Episodes   Time
======= ========= ========== ========== =========
      0 000:00.00      26.83          3 001:00.00
      3 000:03.60      48.79         16 002:00.00
      4 000:04.50      56.83         23 003:00.00
```

```
Printed : 09/03/2003 10:28:34

                              Activity Summary, 5.10
                              ================

Experiment Title            : Sample Test
Experiment Comment          : This is only a test

Resolution (ms)             : 50
Box Size                    : 4
Resting Delay (ms)          : 500
Ambulatory Trigger          : 3
Session Type                : C
Session Time (min)          : 3
Actual Run Time             : 003:00.00
Data Save Interval (sec)    : 60
Start on Animal Entry       : Yes

Raw Filename                : 09032003.C0
Chamber Number              : 1
Chamber Type                : ENV-515-16
Units                       : Cm

Hole Board Installed        : No
Session Comment             : This is the first trial

Subject ID                  : 123
Experiment ID               : Test - Config
Group ID                    : 321
Session No                  : 1
Data Filename               : Subject_123_Group_321_Experiment_Test-Config.Summary

Start Date                  : 9/3/03
Start Time                  : 10:25:29

Detail Reporting Mode       : Relative

Dist.   Time      Amb.   Time      Ster.  Time      Vert.  Vert.     Session
Trav.   Amb.      Cnts.  Ster.     Cnts.  Rest.     Cnts.  Time      Time
======= ========= ====== ========= ====== ========= ====== ========= =========
 189.46 000:02.65     28 000:11.65    131 000:45.70     64 000:09.30 001:00.00
 349.37 000:09.10     88 000:12.10    140 000:35.20     70 000:23.90 002:00.00
 287.92 000:05.20     65 000:08.85    103 000:45.05     58 000:18.60 003:00.00

Jump    Jump      Average    Ambulatory Session
Counts  Time      Velocity   Episodes   Time
======= ========= ========== ========== =========
      0 000:00.00      26.83          3 001:00.00
      3 000:03.60      53.86         13 002:00.00
      1 000:00.90      75.21          7 003:00.00

================================================================================
Distance Traveled   :   826.76
Time Ambulatory     :000:16.95
Ambulatory Count    :      181
Time Stereotypic    :000:32.60
Stereotypic Count   :      374
Time Resting        :002:05.95
Vertical Count      :      192
Time Vertical       :000:51.80
Jump Count          :        4
Time Jumping        :000:04.50
Average Velocity    :    56.83
Ambulatory Episodes :       23
```

Summary data files contain the following measures:

Table A2.1 - Summary Data

Measure (pre-analysis)	Definition (Data are presented in block intervals and session totals)
Dist. Trav. (Cm or In - User-definable)	Distance traveled outside the Box. The combination of Box Size and Resting Delay create a threshold through which a subject must move a given distance (Box Size) in a defined period of time (Resting Delay) to maintain ambulatory movement status.
Time Amb. (Sec)	Time in ambulatory movement status. The time and distance (above) are used to determine velocity.
Amb. Cnts.	The number of beam breaks (counts) while in ambulatory movement status. The difference between counts and distance is precision. Distance data reflect differences in angular movements as discrete and counts data are angle independent.
Time Ster. (Sec)	Time spent breaking beams inside the Box.
Ster. Cnts.	Total number of beam breaks inside the Box. When the animal leaves the Box, it is considered an Ambulatory Episode and beam breaks are no longer counted as Stereotypic. When the animal then stops for an amount of time equal to the resting delay, a new Box based around the animals current position is established and beam breaks are once again counted as Stereotypic.
Time Rest. (Sec)	Time spent with no new beam breaks.
Vert. Cnts.	Number of periods of continuous beam breaks reported by the "Z" I/R Array strips.
Vert. Time (Sec)	Total time breaking "Z" beams.
Session Time	Total session time
Jump Counts	If a subject jumps and leaves the photo-beam array for a period of time, the software records 0,0's for that period of time. The number of continuous 0,0 records will be counted. If the "X" & "Y" I/R Array strips have not been well centered on the subject, there may be error in this data (Chapter 1).
Jump Time (Sec.)	Time spent with 0,0 coordinates, which indicate a jump, under the beams or standing against the wall with all photo-beams passing through their legs. Use care when adjusting the photo-beam array heights.
Average Velocity (Cm/Sec or In/Sec)	The average velocity for each data block and total for the session. This measure may be very useful for establishing criteria by which Box Size and Resting Delay times may be set to establish meaningful Ambulatory settings for various screening protocols. See Appendix IV for additional information.
Ambulatory Episodes	The number of times that the subject leaves the Box and travels the user-defined ambulatory trigger number of beams before the resting delay criteria is fulfilled.
Hole Board Data	See Table A2.3.

Analyzed Data

The analyzed data filenames end with the ZONE extension. Analyzed data files can use either the Relative or Absolute data formats. Both formats are shown below.

```
                              09/03/2003 11:47:39

                           Activity Zone Analysis, 5.10
                           ======================

Experiment Title:            Sample Test
Experiment Comment:          This is only a test
Number of Test Chambers:      1
Resolution (ms):              50
Box Size:                     4
Resting Delay (ms):           500
Session Time (min):           3
Data Directory Name:         C:\PROGRAM FILES\ACTIVITY MONITOR\DATA\
Raw Data File:               09032003.C0
Text Data File:              Subject_123_Group_321_Experiment_Test-Config.Zone
Chamber Type:                ENV-515-16
Units:                       Cm

Chamber Number:               1
Session Comment:             This is the first trial
Subject ID:                  123
Experiment ID:               Test - Config
Group ID:                    321
Session No:                   1

Start:                       9/3/03     10:25:29

Start Time Displayed (mins): 000:00.00
End Time Displayed (mins):   003:00.00
Block Time (secs):           60

Detail Reporting Mode: Absolute

Rotational Analysis
-------------------
Number Of Quadrants X: 17
                    Y: 17
         Valid Radius: 2.75
            Segments:  16
       Segment Limit:  5
       Reverse Limit:  5

                     Counter
         Clockwise   Clockwise
         ----------  ----------
Block 1           0           5
Block 2           3          10
Block 3           3          14

--------------------------------------------------------------------------------
```

Zones Defined

	Start X	Start Y	End X	End Y
Zone 1	0.5	0.5	8	8
Zone 2	8	0.5	16	8
Zone 3	0.5	8	8	16
Zone 4	8	8	16	16

Zone 1 (0.5, 0.5) to (8, 8)

Dist. Tr.(cm)	Time Amb.	Amb. Cnts.	Time Ster.	Ster. Cnts.	Time Rest.	Vert. Cnts.	Vert. Time	Zone Entries	Zone Time
57.90	000:00.85	7	000:04.40	50	000:25.05	19	000:02.80	6	000:30.30
101.45	000:01.50	13	000:06.05	68	000:33.50	24	000:06.25	9	000:41.05
223.22	000:03.95	39	000:10.00	113	000:42.55	51	000:12.90	16	000:56.50

Zone 2 (8, 0.5) to (16, 8)

Dist. Tr.(cm)	Time Amb.	Amb. Cnts.	Time Ster.	Ster. Cnts.	Time Rest.	Vert. Cnts.	Vert. Time	Zone Entries	Zone Time
49.01	000:00.75	7	000:03.75	45	000:11.25	20	000:02.30	4	000:15.75
145.47	000:03.55	33	000:08.80	103	000:24.15	40	000:10.20	9	000:37.60
208.35	000:04.50	44	000:10.90	127	000:51.15	52	000:16.10	15	001:07.65

Zone 3 (0.5, 8) to (8, 16)

Dist. Tr.(cm)	Time Amb.	Amb. Cnts.	Time Ster.	Ster. Cnts.	Time Rest.	Vert. Cnts.	Vert. Time	Zone Entries	Zone Time
36.42	000:00.70	9	000:01.55	16	000:02.85	14	000:02.85	6	000:05.10
123.28	000:03.10	36	000:04.15	46	000:10.05	32	000:09.00	9	000:17.30
162.55	000:04.05	50	000:04.70	52	000:11.75	38	000:10.80	13	000:21.40

Zone 4 (8, 8) to (16, 16)

Dist. Tr.(cm)	Time Amb.	Amb. Cnts.	Time Ster.	Ster. Cnts.	Time Rest.	Vert. Cnts.	Vert. Time	Zone Entries	Zone Time
46.14	000:00.35	5	000:01.95	20	000:06.55	11	000:01.35	5	000:08.85
168.63	000:03.60	34	000:04.75	54	000:13.20	38	000:07.75	10	000:24.05
232.64	000:04.45	48	000:07.00	82	000:20.50	51	000:12.00	16	000:34.45

Zone Totals

Dist. Tr.(cm)	Time Amb.	Amb. Cnts.	Time Ster.	Ster. Cnts.	Time Rest.	Vert. Cnts.	Vert. Time	Zone Entries	Zone Time
223.22	000:03.95	39	000:10.00	113	000:42.55	51	000:12.90	16	000:56.50
208.35	000:04.50	44	000:10.90	127	000:51.15	52	000:16.10	15	001:07.65
162.55	000:04.05	50	000:04.70	52	000:11.75	38	000:10.80	13	000:21.40
232.64	000:04.45	48	000:07.00	82	000:20.50	51	000:12.00	16	000:34.45
826.76	000:16.95	181	000:32.60	374	002:05.95	192	000:51.80	60	003:00.00

Block Summary

Dist. Trav.(cm)	Time Amb.	Amb. Cnts.	Time Ster.	Ster. Cnts.	Time Rest.	Vert. Cnts.	Vert. Time	Zone Entries
189.46	000:02.65	28	000:11.65	131	000:45.70	64	000:09.30	21
538.84	000:11.75	116	000:23.75	271	001:20.90	134	000:33.20	37
826.76	000:16.95	181	000:32.60	374	002:05.95	192	000:51.80	60

Block Summary (Cont)

Jump Counts	Jump Time	Average Velocity(cm/s)	Ambulatory Episodes	Session Time
0	000:00.00	26.83	3	001:00.00
3	000:03.60	48.79	16	002:00.00
4	000:04.50	56.83	23	003:00.00

09/03/2003 11:48:29

Activity Zone Analysis, 5.10
==========

Experiment Title: Sample Test
Experiment Comment: This is only a test
Number of Test Chambers: 1
Resolution (ms): 50
Box Size: 4
Resting Delay (ms): 500
Session Time (min): 3
Data Directory Name: C:\PROGRAM FILES\ACTIVITY MONITOR\DATA\
Raw Data File: 09032003.C0
Text Data File: Subject_123_Group_321_Experiment_Test-Config.Zone
Chamber Type: ENV-515-16
Units: Cm

Chamber Number: 1
Session Comment: This is the first trial
Subject ID: 123
Experiment ID: Test - Config
Group ID: 321
Session No: 1

Start: 9/3/03 10:25:29

Start Time Displayed (mins): 000:00.00
End Time Displayed (mins): 003:00.00
Block Time (secs): 60

Detail Reporting Mode: Relative

Rotational Analysis

Number Of Quadrants X: 17
Y: 17
Valid Radius: 2.75
Segments: 16
Segment Limit: 5
Reverse Limit: 5

	Clockwise	Counter Clockwise
Block 1	0	5
Block 2	3	5
Block 3	0	4
Total	3	14

Zones Defined

	Start X	Start Y	End X	End Y
Zone 1	0.5	0.5	8	8
Zone 2	8	0.5	16	8
Zone 3	0.5	8	8	16
Zone 4	8	8	16	16

Zone 1 (0.5, 0.5) to (8, 8)

Dist. Tr.(cm)	Time Amb.	Amb. Cnts.	Time Ster.	Ster. Cnts.	Time Rest.	Vert. Cnts.	Vert. Time	Zone Entries	Zone Time
57.90	000:00.85	7	000:04.40	50	000:25.05	19	000:02.80	6	000:30.30
43.56	000:00.65	6	000:01.65	18	000:08.45	5	000:03.45	3	000:10.75
121.76	000:02.45	26	000:03.95	45	000:09.05	27	000:06.65	7	000:15.45
223.22	000:03.95	39	000:10.00	113	000:42.55	51	000:12.90	16	000:56.50

Zone 2 (8, 0.5) to (16, 8)

Dist. Tr.(cm)	Time Amb.	Amb. Cnts.	Time Ster.	Ster. Cnts.	Time Rest.	Vert. Cnts.	Vert. Time	Zone Entries	Zone Time
49.01	000:00.75	7	000:03.75	45	000:11.25	20	000:02.30	4	000:15.75
96.47	000:02.80	26	000:05.05	58	000:12.90	20	000:07.90	5	000:21.85
62.88	000:00.95	11	000:02.10	24	000:27.00	12	000:05.90	6	000:30.05
208.35	000:04.50	44	000:10.90	127	000:51.15	52	000:16.10	15	001:07.65

Zone 3 (0.5, 8) to (8, 16)

Dist. Tr.(cm)	Time Amb.	Amb. Cnts.	Time Ster.	Ster. Cnts.	Time Rest.	Vert. Cnts.	Vert. Time	Zone Entries	Zone Time
36.42	000:00.70	9	000:01.55	16	000:02.85	14	000:02.85	6	000:05.10
86.86	000:02.40	27	000:02.60	30	000:07.20	18	000:06.15	3	000:12.20
39.27	000:00.95	4	000:00.55	6	000:01.70	6	000:01.80	4	000:04.10
162.55	000:04.05	50	000:04.70	52	000:11.75	38	000:10.80	13	000:21.40

Zone 4 (8, 8) to (16, 16)

Dist. Tr.(cm)	Time Amb.	Amb. Cnts.	Time Ster.	Ster. Cnts.	Time Rest.	Vert. Cnts.	Vert. Time	Zone Entries	Zone Time
46.14	000:00.35	5	000:01.95	20	000:06.55	11	000:01.35	5	000:08.85
122.49	000:03.25	29	000:02.80	34	000:06.65	27	000:06.40	5	000:15.20
64.00	000:00.85	14	000:02.25	28	000:07.30	13	000:04.25	6	000:10.40
232.64	000:04.45	48	000:07.00	82	000:20.50	51	000:12.00	16	000:34.45

Zone Totals

Dist. Tr.(cm)	Time Amb.	Amb. Cnts.	Time Ster.	Ster. Cnts.	Time Rest.	Vert. Cnts.	Vert. Time	Zone Entries	Zone Time
223.22	000:03.95	39	000:10.00	113	000:42.55	51	000:12.90	16	000:56.50
208.35	000:04.50	44	000:10.90	127	000:51.15	52	000:16.10	15	001:07.65
162.55	000:04.05	50	000:04.70	52	000:11.75	38	000:10.80	13	000:21.40
232.64	000:04.45	48	000:07.00	82	000:20.50	51	000:12.00	16	000:34.45
826.76	000:16.95	181	000:32.60	374	002:05.95	192	000:51.80	60	003:00.00

Block Summary

Dist. Trav.(cm)	Time Amb.	Amb. Cnts.	Time Ster.	Ster. Cnts.	Time Rest.	Vert. Cnts.	Vert. Time	Zone Entries
189.46	000:02.65	28	000:11.65	131	000:45.70	64	000:09.30	21
349.37	000:09.10	88	000:12.10	140	000:35.20	70	000:23.90	16
287.92	000:05.20	65	000:08.85	103	000:45.05	58	000:18.60	23
826.76	000:16.95	181	000:32.60	374	002:05.95	192	000:51.80	60

Block Summary (Cont)

Jump Counts	Jump Time	Average Velocity(cm/s)	Ambulatory Episodes	Session Time
0	000:00.00	26.83	3	001:00.00
3	000:03.60	53.86	13	001:00.00
1	000:00.90	75.21	7	001:00.00
4	000:04.50	56.83	23	003:00.00

The data analysis file contains the first 13 measures listed in the summary data table (A2.1) above plus the following measures:

Table A2.2 - Analyzed Data

Measure	Definition (Data may be presented in block intervals by zone with zone and session totals)
Rotational Analysis	Maximum radius is user definable. Rotations are presented as clockwise and counterclockwise counts.
Zone Entries	The number of times the animal entered the zone from a different zone.
Zone Time	Amount of time the animal is present in each zone.

NOTE: All data may be re-analyzed using different parameters, so make sure that the same measures are being used when performing the statistical analysis.

Hole Board Task Data

The hole board data filenames end with the SUMMARY extension. If hole board strips are installed, then the hole board data files may contain block information with either the Relative or Absolute data formats, just like a regular summary data file. Below is an example of a hole board data file without hole board strips installed and with hole board strips installed.

```
Printed : 09/02/2003 11:19:18

                              Activity Summary, 5.10
                              ================

Experiment Title            : Hole Board Test
Experiment Comment          : Just a test
Resolution (ms)             : 50
Box Size                    : 3
Resting Delay (ms)          : 500
Ambulatory Trigger          : 3
Session Type                : C
Session Time (min)          : 3
Actual Run Time             : 001:15.95
Data Save Interval (sec)    : 180
Start on Animal Entry       : No

Raw Filename                : 09022003.D0
Chamber Number              : 1
Chamber Type                : ENV-515-16
Units                       : Cm

Hole Board Installed        : Yes
Terminate on Task Completion: Yes
Hole Board Strips Installed : Yes
Task Holes                  : 1, 7, 9, 15

Session Comment             : None
Subject ID                  : 555
Experiment ID               : 987654321
Group ID                    : 222
Session No                  : 1
Data Filename               : Subject_555_Group_222_Experiment_987654321.Summary

Start Date                  : 9/2/03
Start Time                  : 11:18:02

Total Session Time    :       001:15.95
Task Complete Time    :       001:15.60
Latency To First Hole :       000:17.15
Novel Task Entries    :              4
Novel NonTask Entries :              6
Novel Entries         :             10

Repeat Task Entries   :              1
Repeat NonTask Entries:              7
Repeat Entries        :              8

Total Entries         :             18
```

```
Avg. Novel Task IRT   :          19.45
Avg. Novel NonTask IRT:           5.37
Avg. Novel Total IRT  :           6.48

Working Memory Ratio  :           0.80
Reference Memory Ratio:           0.28


Printed : 09/02/2003 11:19:18

                              Activity Summary, 5.10
                              ================

Experiment Title            : Hole Board Test
Experiment Comment          : Just a test

Resolution (ms)             : 50
Box Size                    : 3
Resting Delay (ms)          : 500
Ambulatory Trigger          : 3
Session Type                : C
Session Time (min)          : 3
Actual Run Time             : 001:15.95
Data Save Interval (sec)    : 180
Start on Animal Entry       : No

Raw Filename                : 09022003.D0
Chamber Number              : 1
Chamber Type                : ENV-515-16
Units                       : Cm

Hole Board Installed        : Yes
Terminate on Task Completion: Yes
Hole Board Strips Installed : Yes
Task Holes                  : 1, 7, 9, 15

Session Comment             : None

Subject ID                  : 555
Experiment ID               : 987654321
Group ID                    : 222
Session No                  : 1
Data Filename               : Subject_555_Group_222_Experiment_987654321.Summary

Start Date                  : 9/2/03
Start Time                  : 11:18:02

Detail Reporting Mode       : Absolute

Dist.   Time      Amb.   Time      Ster.  Time      Vert.  Vert.     Session
Trav.   Amb.      Cnts.  Ster.     Cnts.  Rest.     Cnts.  Time      Time
======= ========= ====== ========= ====== ========= ====== ========= =========
 129.95 000:01.80     45 000:00.45      9 000:21.50      0 000:00.00 001:15.95

Jump    Jump      Average    Ambulatory Session
Counts  Time      Velocity   Episodes   Time
======= ========= ========== ========== =========
     62 000:34.60      97.00         10 001:15.95

Total Session Time    :       001:15.95
Task Complete Time    :       001:15.60
Latency To First Hole :       000:17.15
```

```
Novel Task Entries    :              4
Novel NonTask Entries :              6
Novel Entries         :             10

Repeat Task Entries   :              1
Repeat NonTask Entries:              7
Repeat Entries        :              8

Total Entries         :             18

Avg. Novel Task IRT   :          19.45
Avg. Novel NonTask IRT:           5.37
Avg. Novel Total IRT  :           6.48

Working Memory Ratio  :           0.80
Reference Memory Ratio:           0.28
```

The hole board data file contains the first 13 measures listed in the summary data table (A2.1) above plus the following measures:

Table A2.3 - Hole Board data

Measure	Definition
Total Session Time	The time necessary to run the session. This may be the task completion time or the session limit time depending upon the setup.
Task Completion Time	Time to enter all of the user-defined (task) holes.
Latency to First Hole	The time elapsed between starting the experiment and entry into the first hole.
Novel Task Entries	Total task holes entered at least once.
Novel NonTask Entries	Total non-task holes entered at least once.
Novel Entries	Entering a hole for the first time.
Repeat Task Entries	Total re-entries into task holes.
Repeat Non-Task Entries	Total re-entries into non-task holes.
Repeat Entries	Each subsequent entry after a novel entry. These can be task or non-task holes.
Total Entries	The total number of entries for an entire session.
Avg. Novel Task IRT	Average time between novel task hole entries.
Avg. Novel NonTask IRT	Average time between novel non-task hole entries.
Avg. Novel Total IRT	Average time between total hole entries.
Working Memory Ratio	The number of novel entries into baited holes divided by the number of entries and re-entries into baited holes.
Reference Memory Ratio	The number of entries and re-entries into the baited holes divided by the total number of entries into baited and non-baited holes.

Exported Raw Data Files

The exported data filenames end with the EXPORT extension. The data files contain the raw data that was recorded when the experiment was first run. The raw data can be exported in the Annotated or Stripped format. Examples of both are given below.

Annotated

```
Experiment Title:           Sample Test
Experiment Comment:         This is only a test
Number of Test Chambers:    1
Resolution (ms):            50
Box Size:                   4
Resting Delay (ms):         500
Session Type:               C
Session Time (min):         3

Hole Board Installed:       No

Data Save Interval (sec):   60
Data Save Mode:             R
Raw Data Filename:          09032003.C0

Chamber Number:              1
Session Comment:            This is the first trial
Subject ID:                 123
Experiment ID:              Test - Config
Group ID:                   321
Text Data Filename:           Subject_123_Group_321_Experiment_Test-
Config.Summary

Start Date:                 09/03/2003
Start Time:                 10:25:29

  Time       X     Y     Z
========= ===== ===== =====
000:00.05 10.00  5.50  0.00
000:00.10 10.00  5.50  0.00
000:00.15 10.00  5.50  0.00
000:00.20 10.00  5.50  0.00
000:00.25 10.00  5.00  0.00
000:00.30 10.00  5.00  0.00
        .
        .
        .
002:59.75  9.00  1.00  0.00
002:59.80  9.00  1.00  0.00
002:59.85  9.00  1.00  0.00
002:59.90  9.00  1.00  0.00
002:59.95  9.00  1.00  0.00
003:00.00  9.00  1.00  0.00
```

Stripped

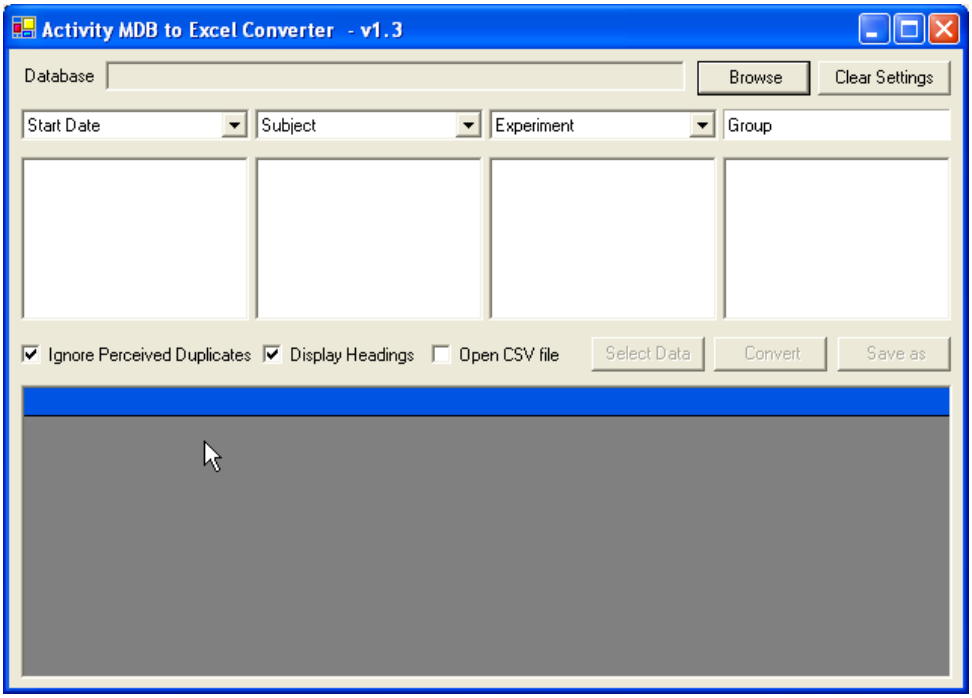
```
000:00.05 10.00  5.50  0.00
000:00.10 10.00  5.50  0.00
000:00.15 10.00  5.50  0.00
000:00.20 10.00  5.50  0.00
000:00.25 10.00  5.00  0.00
000:00.30 10.00  5.00  0.00
        .
        .
        .
002:59.75  9.00  1.00  0.00
002:59.80  9.00  1.00  0.00
002:59.85  9.00  1.00  0.00
002:59.90  9.00  1.00  0.00
002:59.95  9.00  1.00  0.00
003:00.00  9.00  1.00  0.00
```

APPENDIX III

Importing Data Using MDB to Excel

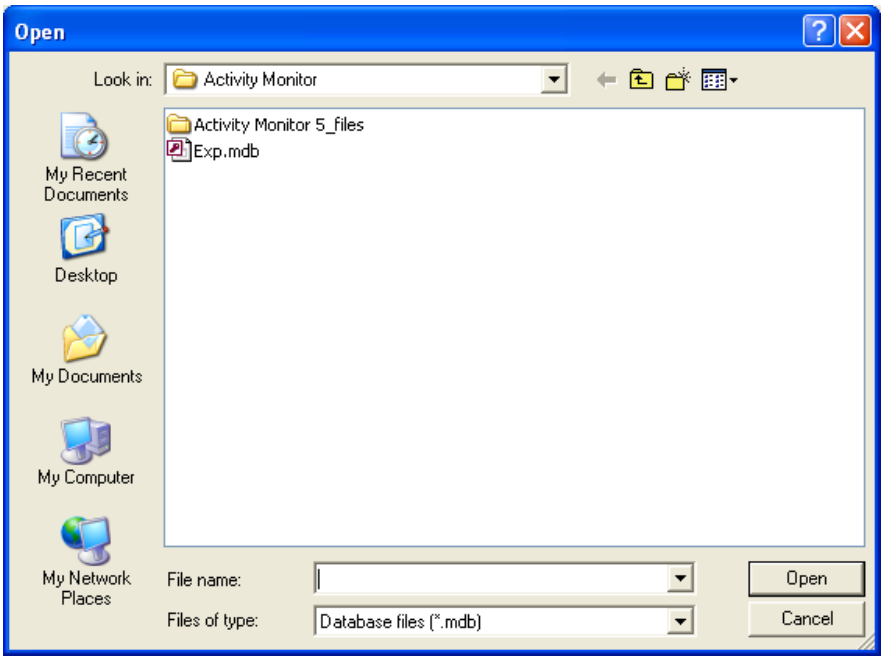
Start **Activity MDBtoExcel**. The screen shown in Figure A3.1 will appear.

Figure A3.1 – Activity MDB to Excel Converter



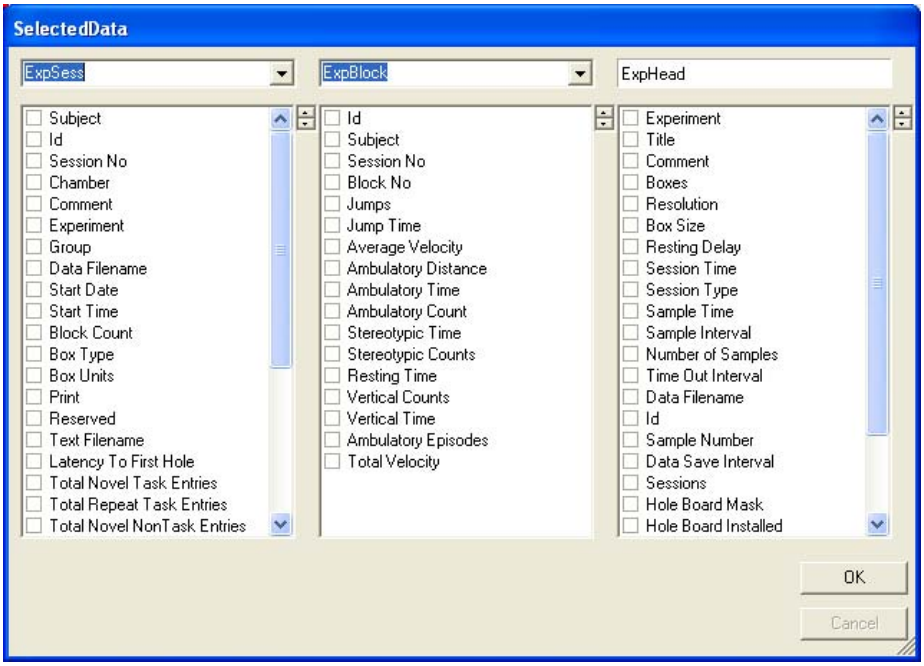
Click **Browse** to select the .mdb file to convert, as shown in Figure A3.2, and click **Open**.

Figure A3.2 - Choose File to Import



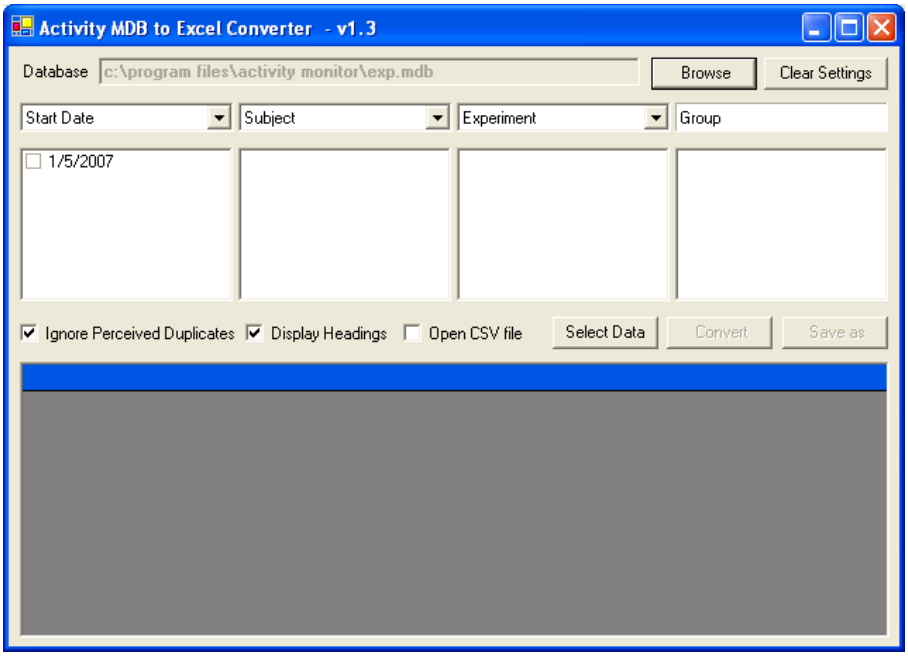
The screen shown in Figure A3.3 will appear.

Figure A3.3 - Select Data



Select the data to be included in the query and then click OK. The screen shown in Figure A3.4 will appear next.

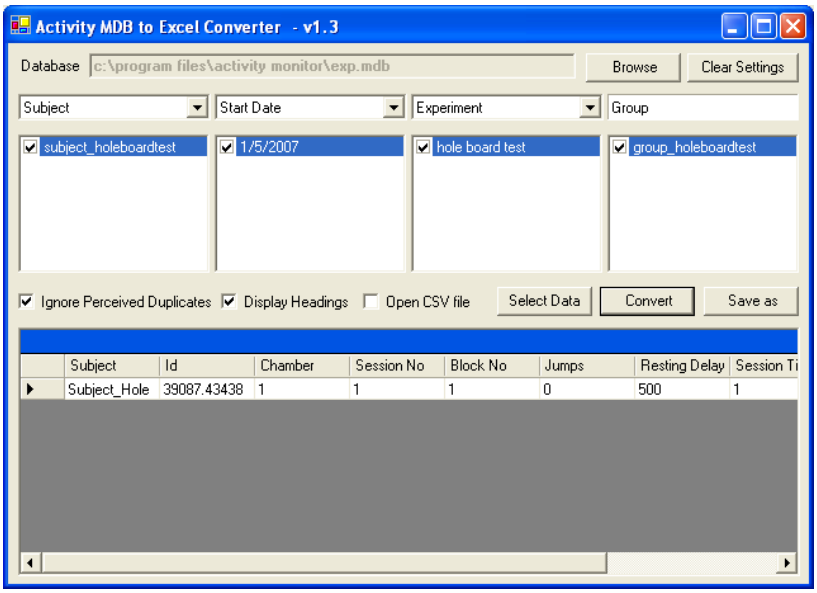
Figure A3.4 – Select Order of Data



The order of the four columns shown in Figure A3.4 may be changed using the pulldown menus. Select the data to be imported. When all the proper selections have been made, click Convert. The converted data will be displayed on the bottom of the screen, as shown in Figure A3.5. Selecting "Open CSV file" prior to clicking Convert will automatically open the imported data in Excel.

Selecting "Clear Settings" deletes all of the data selections made on the screen shown in Figure A3.3. Click "Select Data" to return to this screen and make new selections.

Figure A3.5 – Displaying Imported Data



Click on Save As to save the data in .csv format.

APPENDIX IV

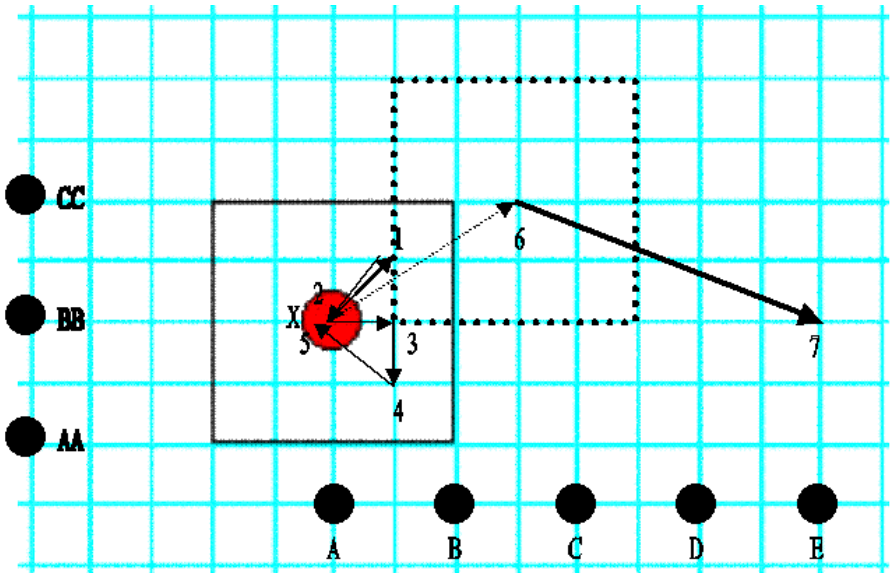
Using Box Size, Resting Delay, Include Resting Delay, and Ambulatory Trigger

Defining Distance Traveled

Box Size is the user-defined number of X or Y photo-beams that must be broken before a movement can be considered ambulatory. Starting at time 0, the box is centered on the subject. When the animal moves from within the Box to outside the Box, it is considered ambulatory and the Box re-centers on the subject. The subject remains ambulatory until it does not leave the last re-centered Box in less than the Resting Delay. Ambulatory Time, Counts, and Distance Traveled are then calculated. If the subject travels equal to or further than the Ambulatory Trigger during the time prior to the Resting Delay criteria being fulfilled, then this constitutes one Ambulatory Episode and velocity is calculated.

The Ambulatory Distance measure includes the distance from the end of the last ambulatory movement episode (time 0 or the last episode whereby the subject did not exit the Box in less than the Resting Delay) to the end of the subsequent ambulatory episode. For example, Figure A4.1 represents a 2-beam Box with a subject making 5 movements within the Box and 2 outside.

Figure A4.1 - Include Resting Delay distance. The pictured dots represent photo beams and each grid represents ½ of a photo beam (the software resolution). Each arrow with a corresponding number represents a subject movement. The dashed arrow is the transition movement to ambulatory and the dashed box is the re-centered box. The dark arrow is the last subject movement and C – E and BB and the beams broken during the ambulatory movement.



Only the distance from X to 6 (the dashed line) is used to determine the Distance Traveled. In this manner, movements within the Box are eliminated, thus providing a "filtered" Distance Traveled measure. At 6 above, the Box re-centers on the subject. If the subject moves through the next Box in less than the Resting Delay, the ambulatory Distance Traveled is the distance from X to 6 + the distance to 7. The number of X + Y photo beam breaks that occurred is the Ambulatory Count. Ambulatory Time is defined as the time from leaving the first Box, until the time that the subject enters the last Box and does not leave in less than the Resting Delay. And this all occurs in one Ambulatory Episode.

If data are parsed into time blocks, an Ambulatory Episode and its associated velocity is only logged in the block in which it ends. Ambulatory Distance Traveled is logged across time blocks, however.

Distance Traveled is modified if Include Resting Delay is activated. If the animal moves from X to 1, 2, 3, 4, 5 and then 6 before the Resting Delay has elapsed, the sum of all movements (distances) from X through 6 is used to determine the Distance Traveled. If the Resting Delay times-out prior to the subject leaving the Box, then the distance from X to 6 is used to determine the Distance Traveled. This measure has been included to allow for consistency with other systems that do not have this "filtering."

The Ambulatory Trigger number adds an additional variable. This number represents the minimum total X + Y beam breaks that must occur to be considered an Ambulatory Episode. The beams must be broken before the Box times-out in order for the Ambulatory Episode and velocity for that given episode to be acquired.

In Figure A4.1, A - D and AA are the beams broken after leaving the box and during a continuous movement of two user-defined sample times (resolution). An Ambulatory Trigger of 4 or less would enable measures 1 and 2 (above) to be determined.

The Ambulatory Trigger is useful if trying to generate a velocity measure that enables the user to determine a Box Size and Resting Delay to differentiate between large/quick and small/slow movements (below). The Ambulatory Trigger can also be used to further define the onset of an ambulatory episode, beyond Box Size and Resting Delay, as continuous.

Differentiating Between Large/Quick and Small/Slow Movements

Given the Box Size, Resting Delay, and Ambulatory Trigger functions described above, it is possible to differentiate groups of subjects based upon their types of movements. The defining measures would be Ambulatory Time, Ambulatory Counts, Ambulatory Episodes, Average Velocity, and Distance Traveled.

Let's assume that we have two groups of subjects, one control group (C) and one locomotor impaired group. The locomotor impaired group is a Parkinsonian animal model (P), for example. If we were to measure Distance Traveled between the two groups, C's may move 1000 cm in 20 minutes with periods of quick movements (high velocity) and periods of minimal movements (resting or stereotypic). Within a 20-minute period, P's may also move 1000 cm with few, if any, fast movements but continuous slow

movements. Therefore, Distance Traveled may not accurately depict between-group differences in locomotor activity.

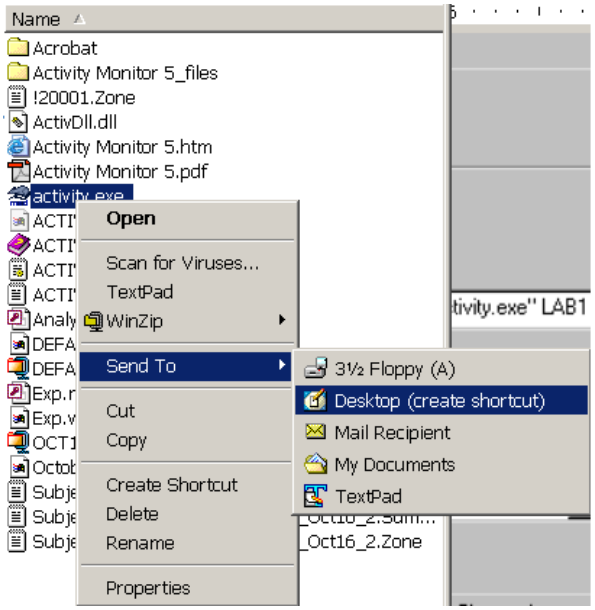
The Box Size and the Resting Delay combine to create a threshold whereby a subject must move a certain distance (Box Size) in a maximum amount of time (Resting Delay) to maintain its ambulatory status. By determining a Box Size large enough for C's to leave in an amount of time (Resting Delay) that P's cannot, the user may be able to differentiate the groups by analyzing for Ambulatory Times and Counts.

APPENDIX V
Multiple Users

Perform the following steps to setup Activity Monitor Version 5.2 and higher so that multiple users can have their own database of experiments:

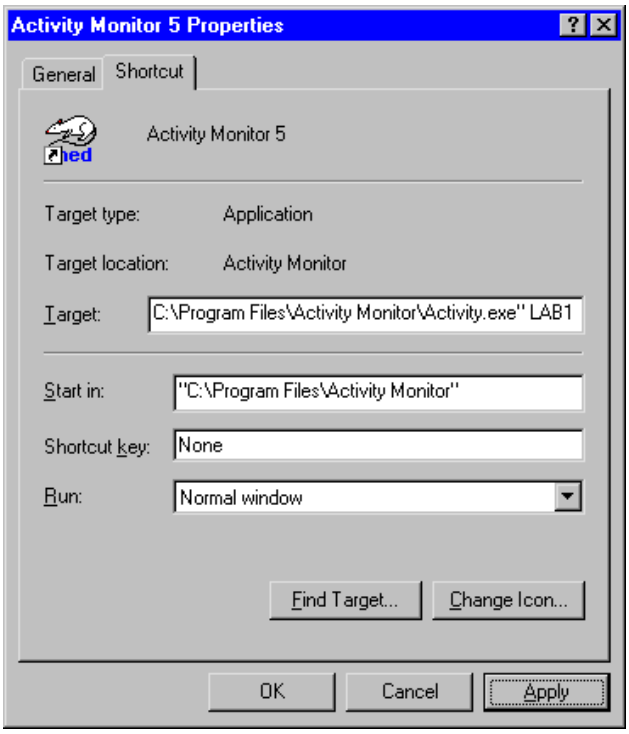
1. Create the new data directories. For the sake of demonstration, we will say the directory names are “C:\LAB1” and “C:\LAB2”;
2. Right click on the activity.exe file in the Activity Monitor folder. Highlight and click on **Send To | Desktop (create shortcut)**, see Figure A5.1;

Figure A5.1 - Right Click Menu for Activity Monitor Shortcut



3. Create as many shortcuts as there are new data directories (in this example, two);
4. Right click on one of the shortcuts that have just been created and select **Properties**;
5. Change the Target box from “C:\Program Files\Activity Monitor\Activity.exe” to read “C:\Program Files\Activity Monitor\Activity.exe” LAB1 (Figure A5.2);

Figure A5.2 - Properties of Activity Monitor Shortcut



LAB1 will be the name of the INI file that will store all of the Activity Monitor preferences including the Data Directory. There can be no spaces in the file name.

Make the same change to each shortcut that was created.

6. Now when Activity Monitor is started with the new shortcut go to the **File | Preferences**;
7. Click on the **Browse** button and select the directory that was just created (e.g. C:\LAB1)

When the Preferences screen is closed it will create a new file called LAB1.INI file in the C:\Program Files\Activity Monitor directory.

It is recommend that the shortcuts be renamed to something meaningful. The Activity Monitor program has been developed to create the databases, *.SUMMARY, *.ZONE, *.EXPORT, and *.ZIP files in the directory indicated.

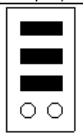
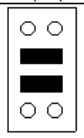
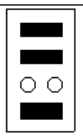
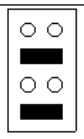
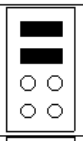
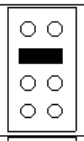
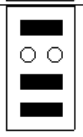
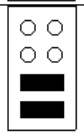
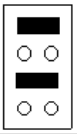
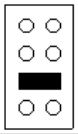
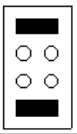
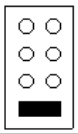
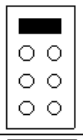
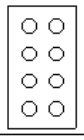
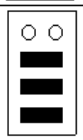
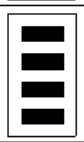
APPENDIX VI

ENV-520 Jumper Positions for Nodes 1-16 (Chambers 1-8)

Inside the silver ENV-520 controller box is a board with four rows of two pins. The pins are located in the bottom right corner. These pins are used to set the address (node) of each controller (and ultimately, chamber). The chambers are configured prior to shipping; however, should the need to change the address of a chamber arise, the following settings should be used. The jumpers that are removed indicate the chamber number.

Note: 32-beam chambers have two nodes per chamber. The nodes do not go in order instead they run 1 and 9, 2 and 10, 3 and 11, etc.

Figure A6.1 - Jumper settings for the ENV-520

Chamber #	JP2 (Jumper) Setting	Chamber #	JP2 (Jumper) Setting
1		9	
2		10	
3		11	
4		12	
5		13	
6		14	
7		15	
8		16	

APPENDIX VII
Hole Board Protocols

Non-Habituation Protocol

Typically, food deprived (overnight deprived or 80% body weight deprived) subjects are placed into the test chamber. All 16-hole board task holes are baited with food. Protocols can end when the session time expires or upon completion of the task (see Chapter 7). The task is defined in this paradigm as at least one entry into each of the 16 holes. The task can be timed behaviorally and the trial terminated upon completion of the task or a fixed time trial can be run whereby post-task data may be obtained. The subjects learn over trials to optimize reward and must also remember (spatially) which holes it has already "visited" in the current trial.

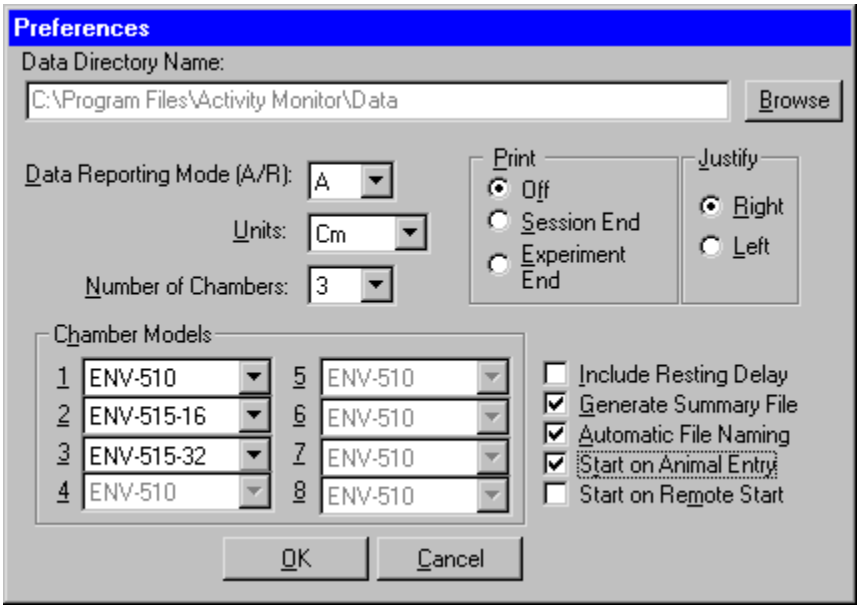
Habituation Protocol

Animals may be habituated to the procedure by introducing them to the hole board and running the animals with a reward placed in all 16 holes. The habituation period can then be followed by a training period. During these sessions, the animals can be trained to find task-associated holes that are filled with an accessible food pellet. Non-task associated holes have the reward placed under the screen. In this way, the subjects cannot discriminate between baited and non-baited holes by olfactory stimuli. Subjects may be removed from the hole board either after all task holes were visited (**File | Run | Open Experiment | Add New Experiment | Define Task Floor | Terminate on completion of task**) or after the total testing time. Reference memory is defined as the number of visits and revisits to the baited holes divided by the total number of visits to baited and non-baited holes. Working memory is calculated as the ratio of the number of novel food rewarded visits to the total number of visits and revisits to the baited set of holes.

APPENDIX VIII

Start on Remote Start Command

Figure A8.1 - Preferences



The **Start on Remote Start** option enables the user to synchronize the recording of data from the activity chamber with an external program (ex: MED-PC IV). When the Start on Remote Start option is selected, Activity Monitor will not start recording data until the Remote Start command arrives. To use Start on Remote Start, start the experiment as normal, then have MED-PC send the Remote Start command at the appropriate time.

The Remote Start command is included in the file MED Global Functions.dll. This file was installed on the computer when Activity Monitor 5 was installed. If Windows 98 is being used, this file was installed into the C:\Windows\System directory. If Windows 2000 is being used, this file was installed into the C:\WINNT\System32 directory. If Windows XP is being used, this file was installed into the C:\Windows\System32 directory.

The function that is used to issue the Remote Start command looks like:

```
void StartActivityChamber(int Box);
```

The Box parameter is the chamber number to start (i.e. 1 – 8). Entering 0 as the Box number will cause Activity Monitor to start all of the chambers.

To issue the command from inside MED-PC IV, include the file ACTIVITY.HED in the USER.PAS file. For example:

```
{Place $I Filename.HED files here.}
{$I ACTIVITY.HED}
```

Then from inside the program issue the StartActivityChamber command as follows:

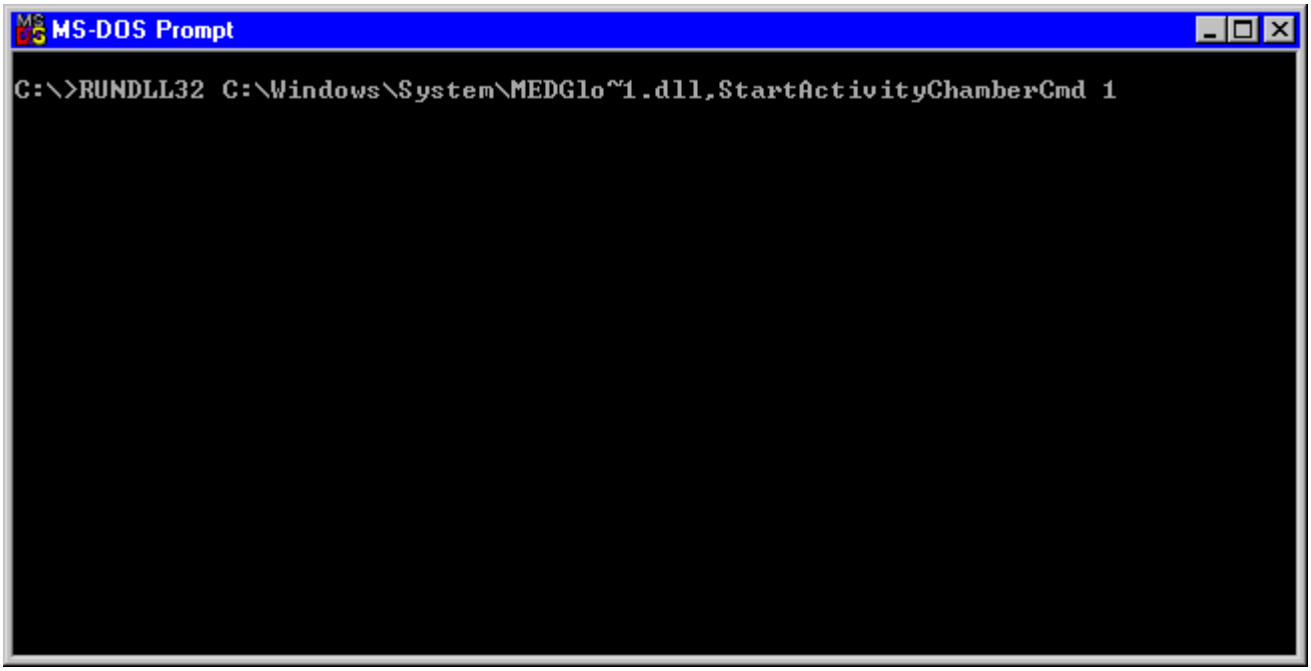
```
S.S.1,
S1,
  .01": ~StartActivityChamber(BOX);~ ---> S2
```

It is also possible to send the StartActivityChamber command from a DOS Prompt. To send the command from a DOS Prompt use the RUNDLL32 command as follows:

```
Windows 98:    RUNDLL32
C:\Windows\System\MEDGlo~1.dll,StartActivityChamberCmd 1
Windows 2000:  RUNDLL32
C:\WINNT\System32\MEDGlo~1.dll,StartActivityChamberCmd 1
Windows XP:    RUNDLL32
C:\Windows\System32\MEDGlo~1.dll,StartActivityChamberCmd 1
```

Use the DOS 8.3 file name format as shown above and in Figure A8.2 or the command will not work.

Figure A8.2 – StartActivityChamber command sent from a Windows 98 DOS prompt



There is a corresponding StopActivityChamber command, which stops the corresponding chamber when the command is received. The StopActivityChamber usage is identical to StartActivityChamber, as documented above.

APPENDIX IX
DIG-729 ISA Card

If a DIG-729 ISA card is being used, install the DIG-729 card according to the instructions provided with the computer for installing an ISA card. The Interrupt Request (IRQ) number may be changed from the factory default of 5 by moving the jumper on J4 to 3, 4, or 7 (Figure A9.1). This should not be done unless there is a conflict with another device in the system. The base address also should not be changed unless there is a conflict.

Figure A9.1 - DIG-729 ISA Switch Locations and Jumper Settings